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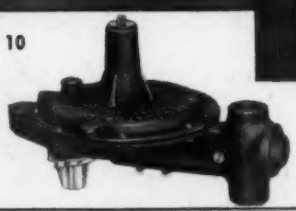
AMERICAN GAS JOURNAL

90th YEAR | OCTOBER, 1948 | VOL. 169, NO. 4

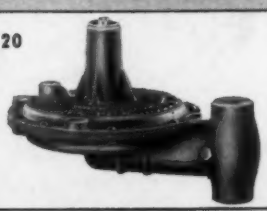
Reynolds

BUILDS THE COMPLETE LINE OF HOUSE SERVICE REGULATORS

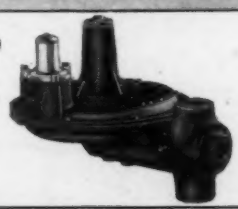
MODEL 10



MODEL 20



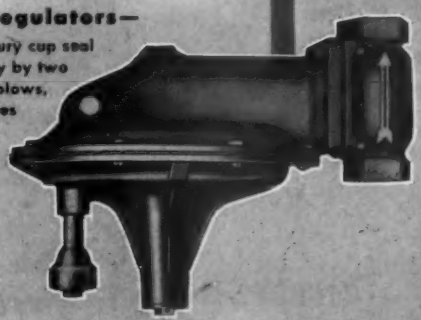
MODEL 30



For all service regulators—

Reynolds exclusive mercury cup seal is held rigidly to the body by two screws. In case the seal blows, the patented design insures recovery of 95% to 97% of mercury.

Illustrated above on Model 10



Reynolds builds the complete line of House Service Regulators specializing in Gas Control Devices since 1892. Reynolds learned early that no one regulator would satisfy all operating conditions or meet all service requirements. Briefly, the variances in the four types of Reynolds Service Regulators are listed below.

Model 10, straight lever type—dead weight or spring type, with or without mercury seal.*

Model 20, straight lever type—dead weight or spring type, with or without mercury seal. All working parts so accurate as to permit complete interchangeability in shop.

Model 30, toggle lever type—dead weight or spring type, with or without mercury seal. Available for horizontal or vertical connection with removable valve pocket.*

Model 30, N.R. 8200 E.V.—toggle lever type. Four installation positions for connections with two installation positions for spring top either pointing upward or downward.*

★ *All working parts so accessible as to be interchangeable without removal from pipe line.*

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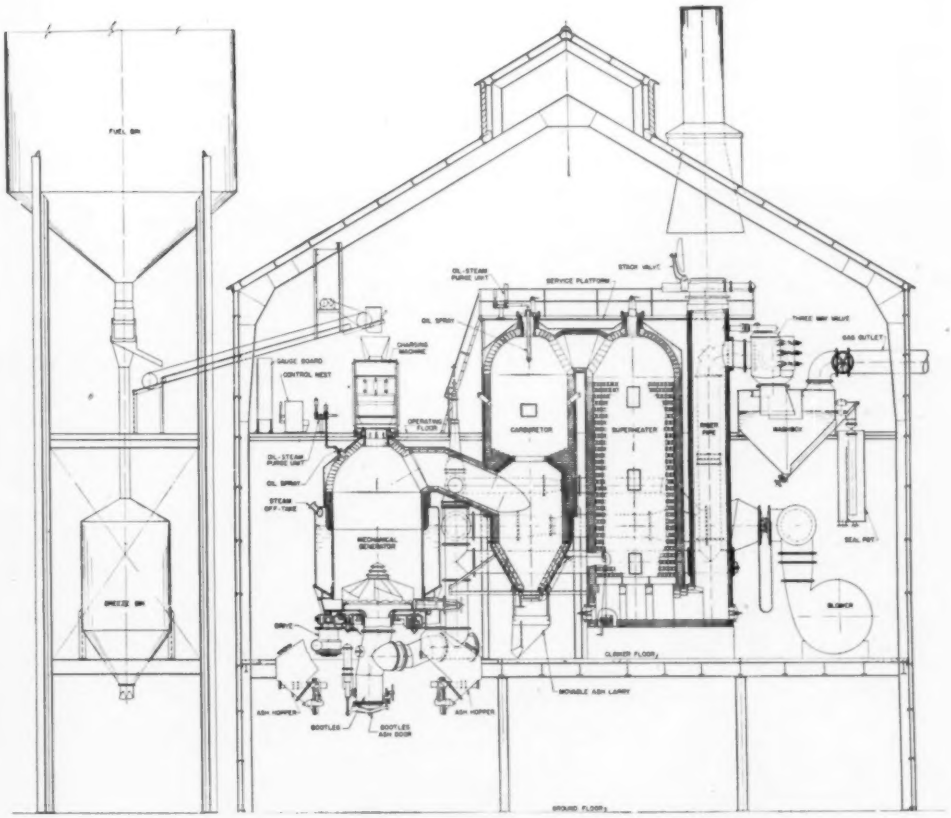

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The Semet-Solvay Reverse Flow Water Gas Machine has been specifically engineered for the operating man. In its present form it is well equipped to fit his particular requirements. The basic needs of gas production have been our guide through every step of perfecting the design.

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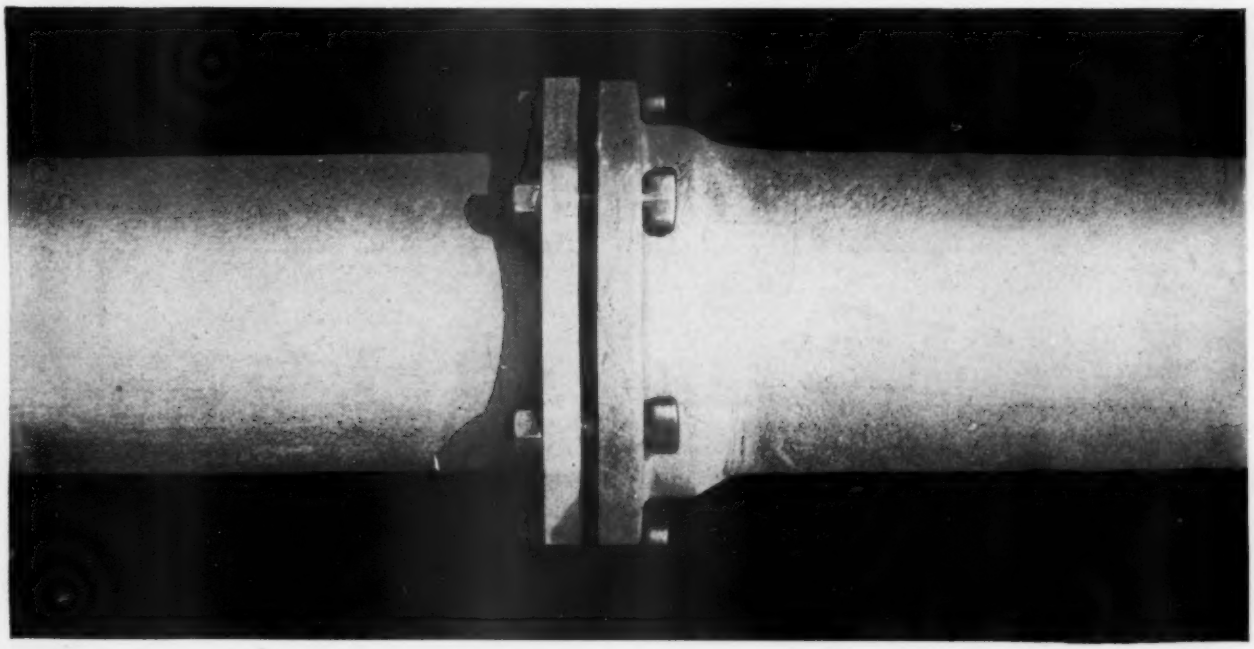

Cast Iron Pipe Research Association
Thomas F. Wolfe, Engineer, Peoples Gas Bldg., Chicago 3.

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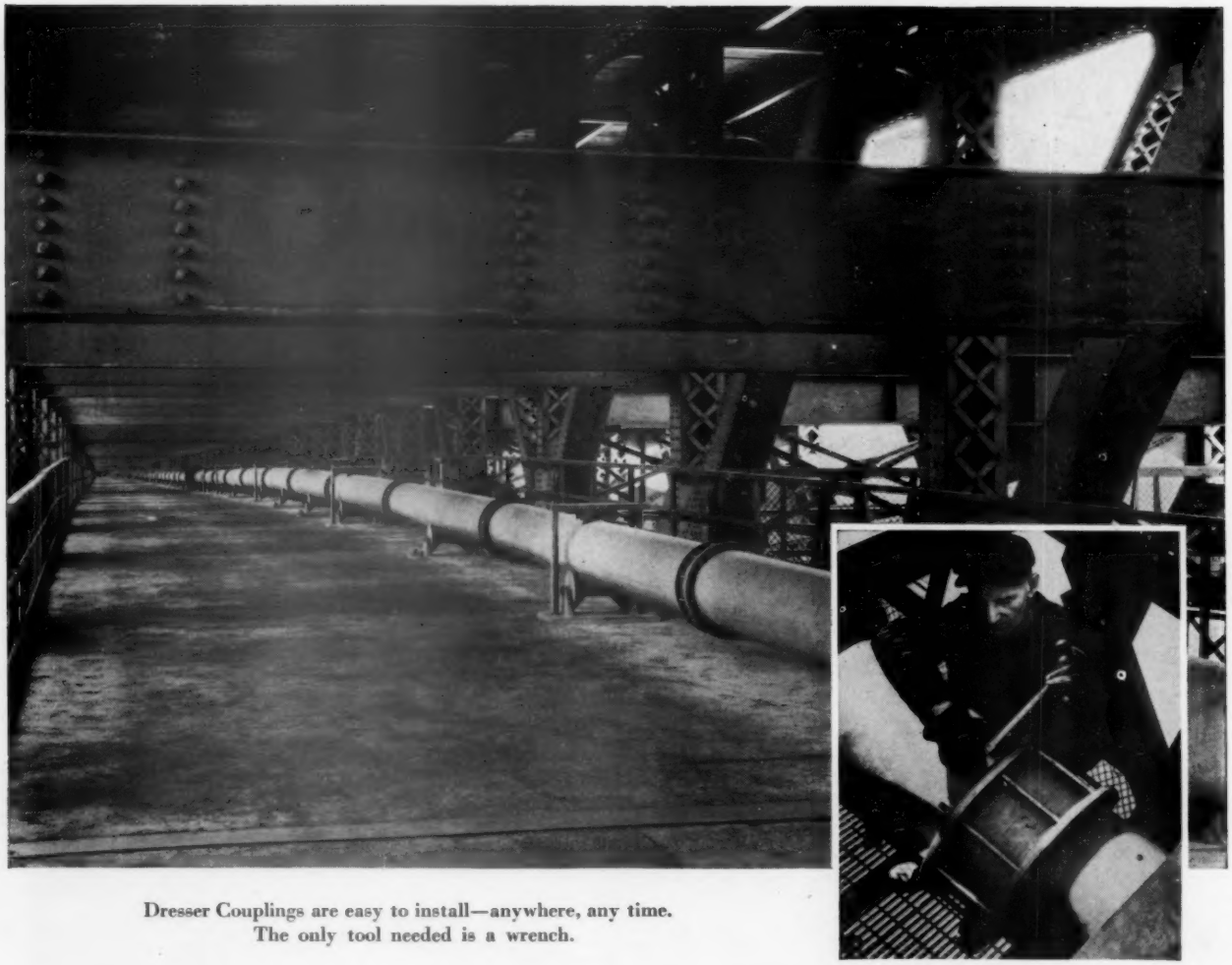
PIPE



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Solution: *Combine flexibility with permanent tightness by using a Dresser-Coupled line.*

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Thoroughly tried and tested for over 60 years, Dresser Couplings offer *proved* dependability. Use them on your lines. And remember, it's always good practice to order your couplings at the time you order your pipe.

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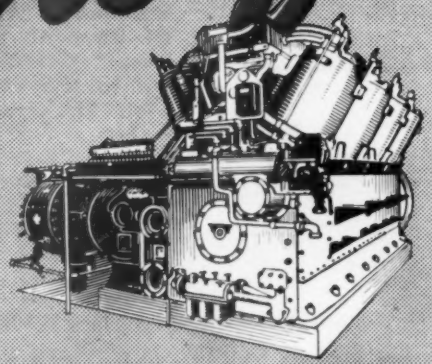

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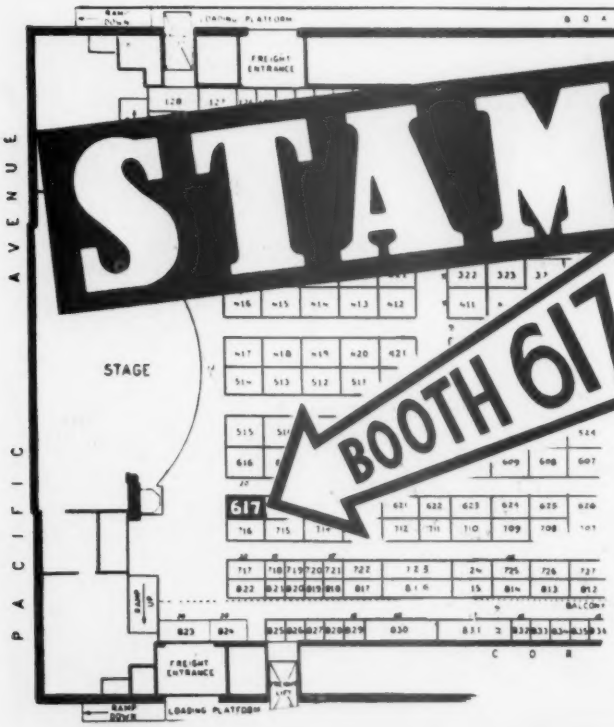

WE HOPE TO SEE YOU HERE

During the A. G. A. Convention, Oct. 4-8 at Atlantic City, our engineers will be in attendance to discuss any problems that may be troubling you in connection with Gas Holders, Purifiers, or High Pressure Tanks; and to give you any information desired on STAMANCO Equipment.

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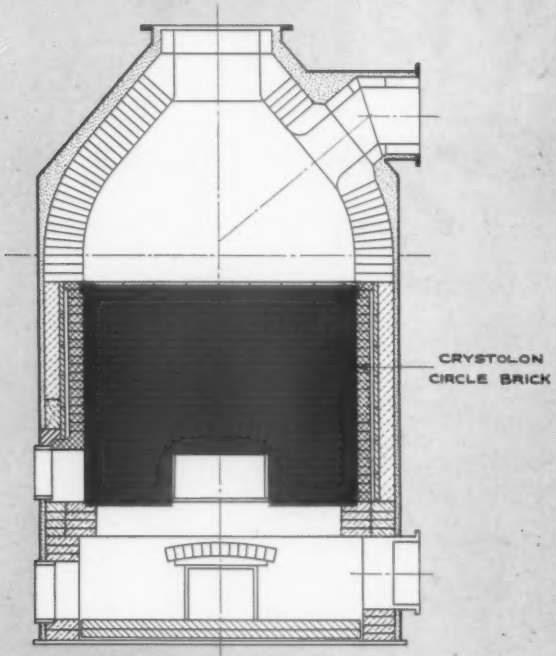
Generator lining pays for itself in One Year . . . when long-lived **CRYSTOLON** Brick are used . . .



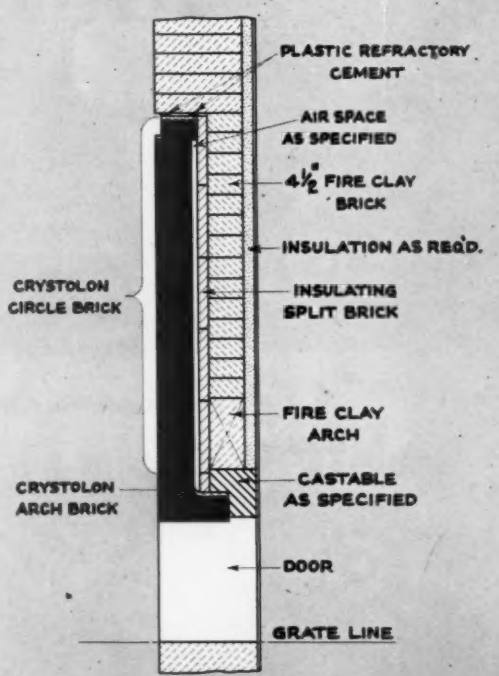
The commercial manufacture of gas involves the skillful handling of high temperatures which are accompanied by severe chemical conditions. One of the basic problems in gas production, therefore, is a refractory problem. The most successful refractory for lining gas generators is silicon carbide which Norton Company manufactures under the trade-mark of CRYSTOLON.

(left) Sectional drawing of gas generator lined with CRYSTOLON refractory shapes.

CRYSTOLON brick are helping many plant superintendents three ways: increased plant capacity, decreased maintenance costs, long lining life.

Where CRYSTOLON brick are used to line the fire zone of the generator, "downtime" for clinkering is greatly reduced. These brick present an impenetrable surface to clinkers with the result that walls are quickly cleaned leaving a larger effective furnace cross-section than with less refractory brick.

(right) Cross-section of gas generator wall showing details of refractories includ- CRYSTOLON inner lining.

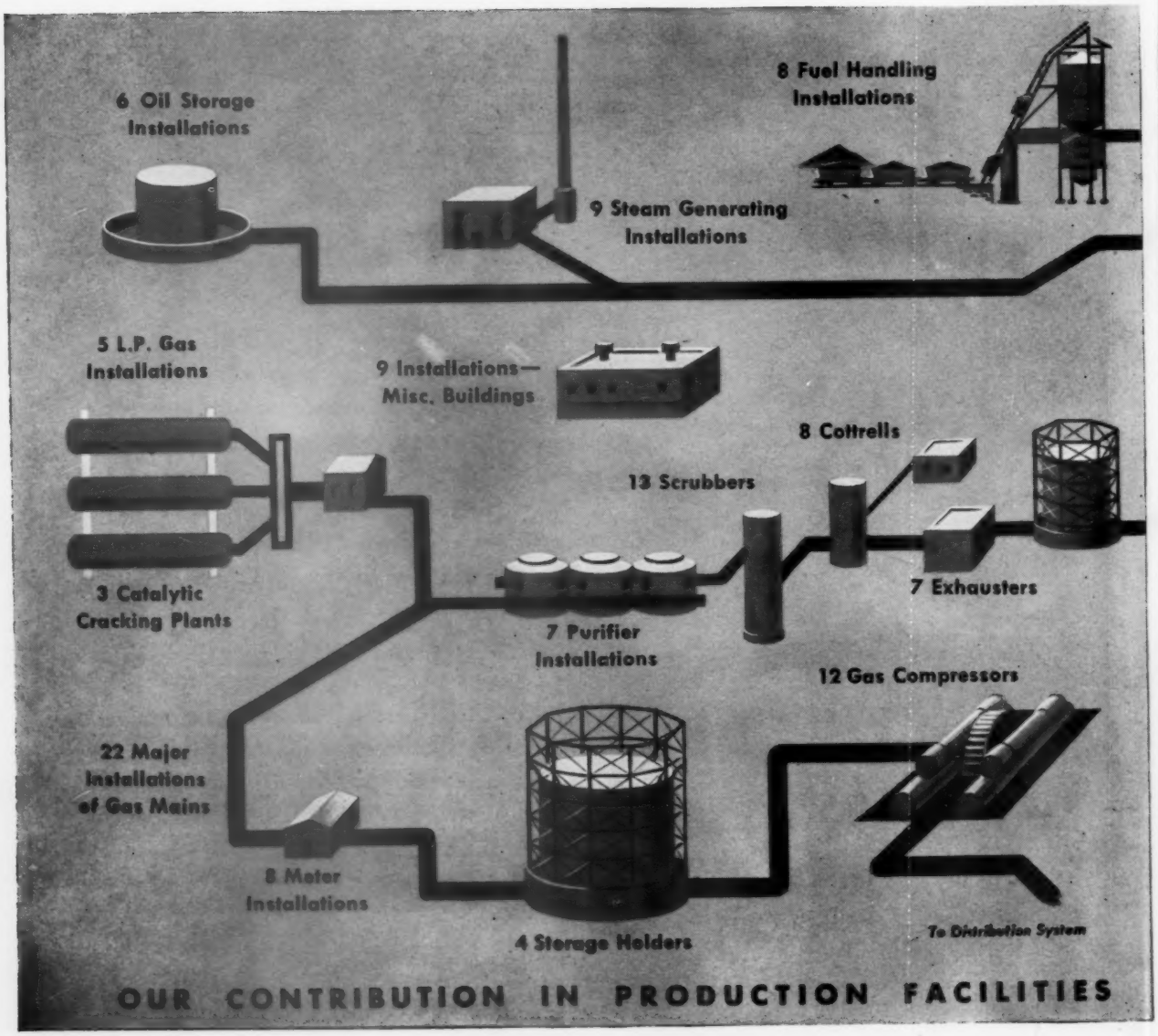


CRYSTOLON brick decrease maintenance cost by greatly extending periods between repair jobs and by reducing cleaning time. Because of the dense, hard surface of CRYSTOLON brick it is only necessary to break the clinker ring in one place and the entire ring will then fall free. CRYSTOLON linings often pay for themselves the first year by savings in cleaning costs alone.

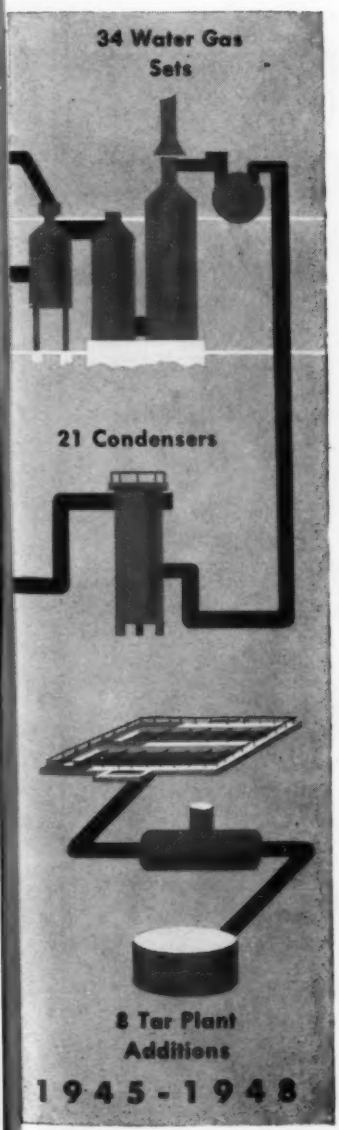
The results which may be expected from the CRYSTOLON lining will vary with different operating conditions. In some cases, a total operating time of 8000 hours is considered satisfactory. Over 22000 hours have been attained without major repairs.

NORTON COMPANY
Worcester 6, Massachusetts

the new **growth** in the gas industry



UGI Equipment



All of us in the gas industry recognize that we are in a period of unequalled new growth. Yet the magnitude of this new growth is sometimes difficult to appreciate.

In one phase of the growth—the construction of production plant facilities—some indications of this magnitude are evident from the work of our company. A sharp increase in our volume of gas plant construction, starting in 1945, reached a level—sustained through 1947 and 1948—of over six times the average of the preceding fifteen years.

Here we show in terms of total equipment installed, our contribution to the New Growth in the Gas Industry.

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S. G. KRAKE, *President and Treasurer*

M. E. KELLEHER, *Secretary*

S. G. KRAKE, *Managing Editor*

H. T. MATTHEW, *Business Manager*

JAMES C. MUNN, *Midwest Representative*
2253 Delaware Drive, Cleveland 6, Ohio
Tel. ERieview 1726

JEROME W. POWER, *Chicago Representative*
708 West 76th St., Chicago 20
Tel. Vincennes 6-5734

FRED A. HERR, *Pac. Coast Representative*
424 S. Broadway, Los Angeles 13
Tel. MAdison 6-5421

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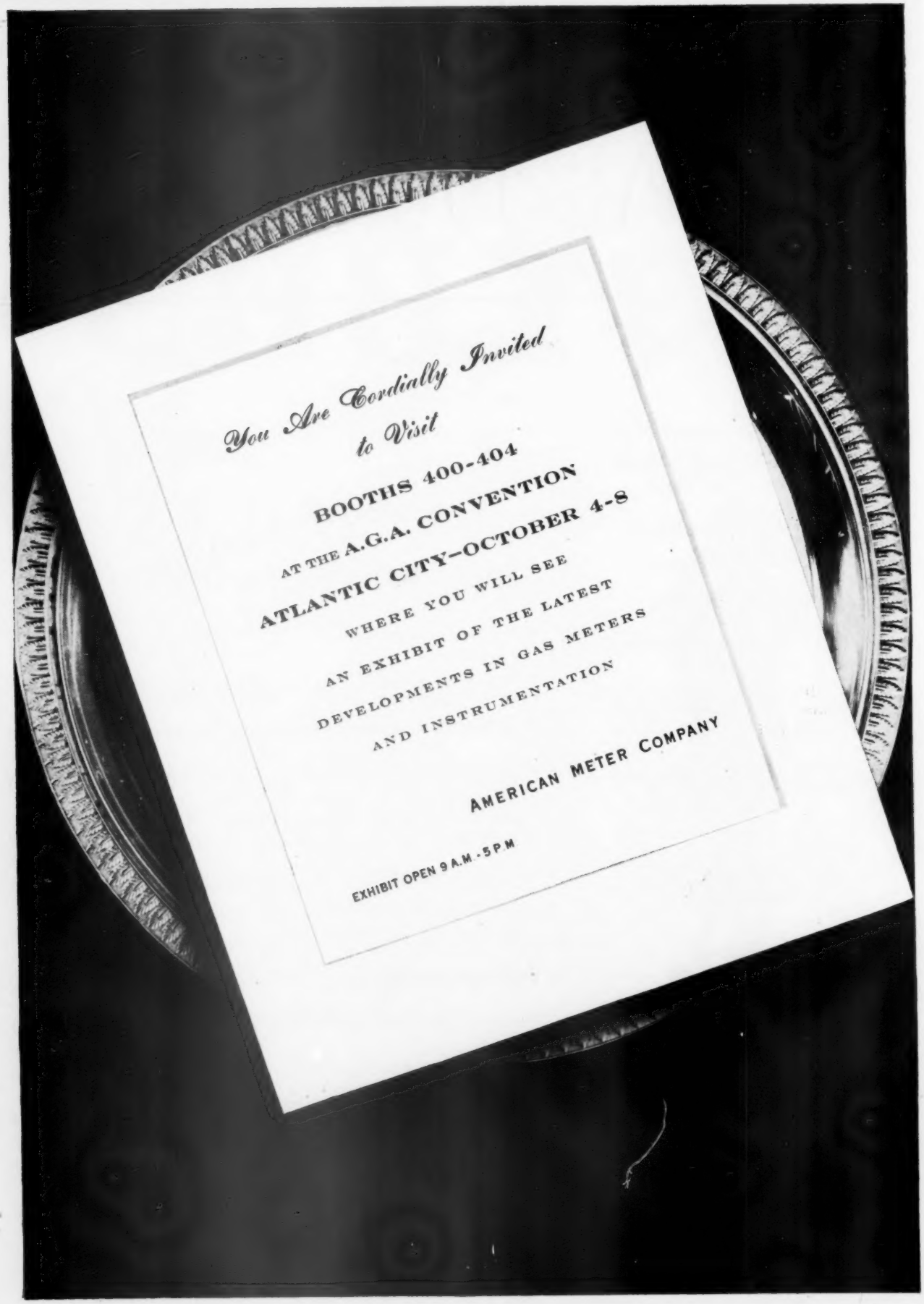
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OCTOBER
1948

AMERICAN
GAS JOURNAL

VOLUME 169
NO. 4

G.A.M.A. Leads the Way

THAT provocative, typical American greeting—"What's NEW?" will be voiced countless times at the GAMA exhibition during the A.G.A. convention. It is appropriate then at this time that it be the theme of this presentation of progress.

New plans, new programs, new products—GAMA and its membership are concerned with all these as they affect the affairs of the entire gas industry. Approaching the threshold of 1949 the golden, American word "NEW" takes on even more importance.

GAMA's sponsorship of the Atlantic City exhibition, one of its major prospects, with more than 170 manufacturers of gas appliances and equipment displaying new and improved products, demonstrates what cooperative effort under trade association guidance can do to stimulate confidence and action in a forward movement to meet needs and problems of the immediate future.

The primary purpose of GAMA in its present programs already under way and tested, those new ones to be inaugurated and those proposed—is aimed at one single objective: to promote the use of gas as a fuel through developing cooperative relations with the gas utilities, gas distributors, gas appliance equipment dealers, and customers. Many time-tried and new techniques of understanding are being employed by the Association membership to increase and maintain cooperation among its members for proper use and increased distribution of gas appliances and equipment.

To achieve these primary purposes these programs have been inaugurated by GAMA to cope with the huge consumer sales potential as well as to meet the problems harassing manufacturers. Here are a few of GAMA's projects:

Water Heaters

- Development of a new promotional, sales and advertising program for 1949 to stimulate interest in, and sales of gas water heaters. This project is under the auspices of the GAMA Water Heater Division and will be known as the "Court of Flame" campaign. An advertising budget to advertise gas water heaters nationally has already been appropriated by the division.

Ranges

- GAMA through its Domestic Range Division has organized, intensified and is giving full support to the Fall campaign designed to sell gas ranges of all kinds which is being conducted under the direction of AGA. GAMA is cooperating with the Domestic Range Committee of AGA of this promotional campaign entitled, "Smart Cooks Know—Gas Has Got It." It has aided in wide distribution of promotional portfolios prepared by AGA for use by utility executives and dealers. GAMA's plans for extensive support of the 1949 promotion and advertising campaign for "CP" ranges is being stepped up and enlarged.

Incinerators

- Special efforts for telling the story of home disposal units are being formulated and being translated into action by the Incinerator Division of GAMA. This enterprise on the part of a relatively new GAMA group is being definitely shown in the joint display and central information bureau sponsored by these men of the disposal industry at the Atlantic City exhibition. "Gas Always Serves," is their slogan.

Services

- Individual manufacturers with support from the various services of GAMA, are increasing their own budgets for promotional and sales campaigns of appliances and equipment.

Research

- The statistical research projects of GAMA now underway are being expanded monthly so that manufacturers may coordinate their constructive efforts to best advantage.
- New statistical research services of GAMA will be launched during 1949 to keep pace with the needs of manufacturers and utilities alike.

Home Heating

- A survey of gas limitations for home heating by GAMA's Statistical Department is already under way and revealing valuable information for manufacturers of gas central heating equipment who find it difficult to undertake any long range planning without first hand knowledge of gas limitations. Realizing the extent of the interest of both gas utilities and manufacturer's executives, relative to gas limitations, a "pilot" survey has been conducted among a certain few utilities chosen because of geographical locations. The survey received the full endorsement of these gas utilities representing more than six million residential gas meters. The collection and processing of this vital information will be extended and should be of benefit to all concerned. The results should provide the manufacturers with accredited information and permit more intelligent work planning on a short and long term basis. The gas utility company should benefit through the assurance of its full share of heating markets.

The importance of this information, it is felt, merits the cooperation of the gas utility companies to provide a guide for manufacturing schedules and for the mutual development of the ever-expanding heating markets today and in the future.

Pipe Lines

- A continuing study of natural gas supply and construction is being kept current. The study covers natural gas construction period July 1, 1945—May 15, 1948 and shows projects pending approval of the Federal Power Commission on May 15, 1948. The study also reports miles of pipelines, horsepower of compressors, communities benefited and other pertinent information.

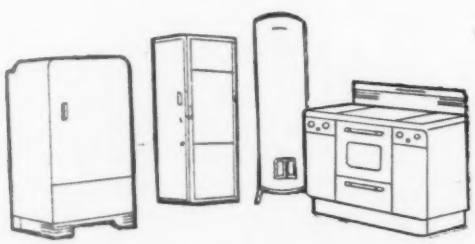
Statistics

- Data for evaluating gas appliance markets is being made available through GAMA's Statistical Department. Many manufacturers are showing interest in this market information, particularly in the trading area system of sales reporting. These are where people do their shopping. Such a system is now operating for gas range manufacturers and gas water heater manufacturers are considering adopting a similar system. GAMA has recently added quarterly statistical reports on the sale of commercial cooking equipment, and annual and monthly reports on direct heating equipment sales.

- GAMA maintains an office in Washington which keeps the membership informed on procurement, legislative and other governmental affairs.

The above outlines reflect only a few of the activities of GAMA. Constantly arising and changing problems call for expanding service in many directions. One of the outstanding signs promising well for the days ahead is the increased understanding of mutual problems that has stemmed from A.G.A.-GAMA joint projects. The two organizations have been able to work together on many important sales and technical undertakings in an atmosphere of confidence and sympathy. This cooperation is one of the major influences contributing to the advancement of the gas industry, GAMA leadership believes.

GAMA is more and more active as a clearing house for information. It provides information for those outside the industry about the industry, provides progress reports to its members on the accomplishments of the various committees and distributes technical bulletins.



LP Gas From the Ground Up

By

William H. Kramer

District Manager, Philgas Division
Sales Department—Phillips Petroleum Company, New York

William H. Kramer

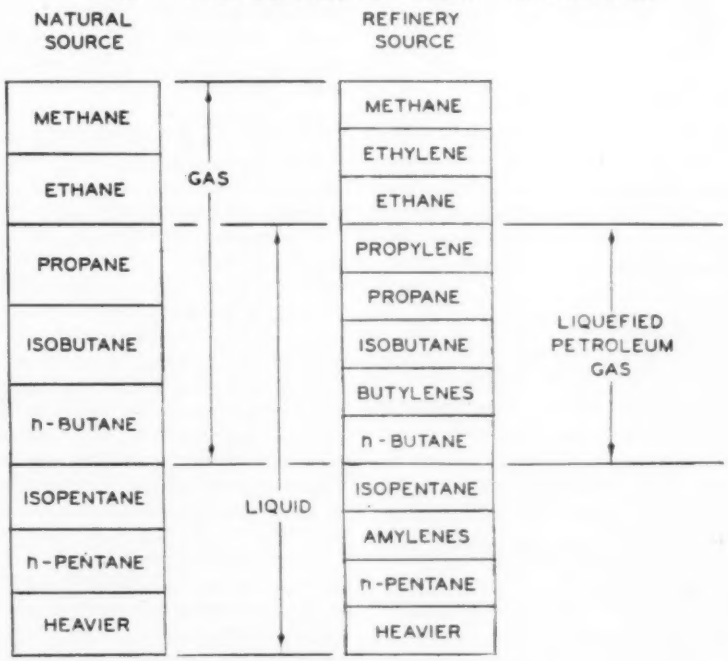
BACK IN 1910 in a little town in West Virginia a Natural Gasoline Plant was experiencing the usual trouble with the escape of gases boiling out of their casing head gasoline. This not only created a possible hazardous condition at the plant and in the shipment of their gasoline, but also resulted in a definite economic loss of material. To correct the trouble, the gases were liquified by compressing and cooling and thus started the first commercial recovery of LP Gas. About 18 years later, or around 1928, we can say that the LP Gas Industry as we know it today, was born. It was at this time that the large oil and natural gas companies entered the business.

Definition

The term liquefied petroleum gas or LP Gas as we call it, shall mean and include any material which is composed predominantly of any of the following hydrocarbons or mixtures of them; Propane, Propylene, Butanes (normal & iso) and Butylenes.

LP Gases at normal atmospheric temperatures and pressures are gaseous, but are readily liquefiable by the application of moderate pressures for ease of handling. As indicated in *Figure 1*, LP Gases coming from natural sources, consist generally of propane, isobutane and normal butane with small amount of ethane usually present. LP Gases coming from refinery sources have in addition to these products, propylene and butylenes as well as small quantities of ethylene. Because LP Gas is a mixture of these various hydrocarbons, its actual properties will vary somewhat from the values given later, which are for the individual components.

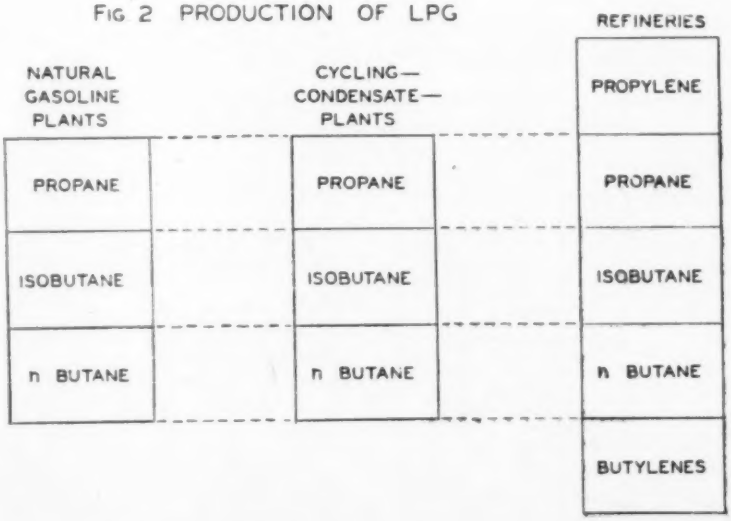
FIG 1 HYDROCARBONS FROM PETROLEUM



Generally LP Gases are produced from three different sources, natural gasoline plants, cycling plants, and refineries. *Figure 2* shows these gases. *Figure 2A* is a typical flow sheet for LP Gas recovery at a gasoline plant. Briefly here is what happens.

When crude oil flowing from a well reaches the surface it is generally delivered to a separator, which removes the entrained gas and collects the oil at the bottom. From here it is sent to storage and is ready to be sent by tank car, pipe line or other means, to a refinery.

FIG 2 PRODUCTION OF LPG



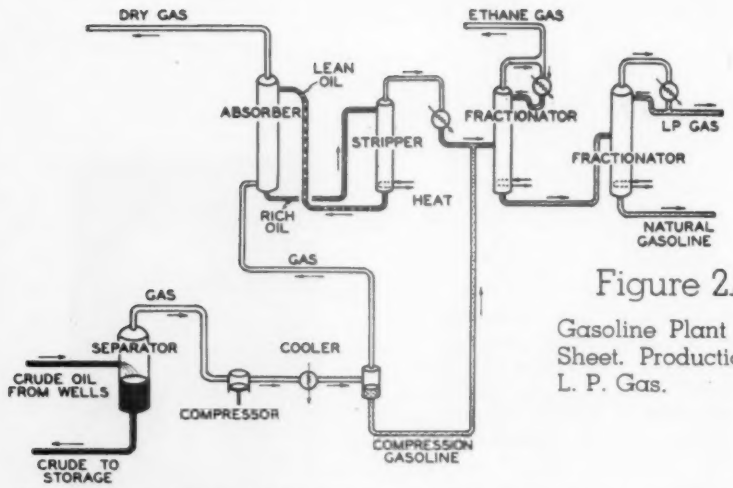


Figure 2A

Gasoline Plant Flow Sheet. Production of L. P. Gas.

The gas from the top of the separator is first compressed and then cooled to remove the heat of compression. In cooling some of the constituents are condensed as a liquid. This liquid is often called compression gasoline.

The gas now flows to an absorber, a tall vessel where it enters at the bottom. Absorption oil enters at the top of the column and flows downward over a series of trays. The gas rising through this oil curtain is washed free of heavier hydrocarbons and leaves the top as "Dry Gas." This dry or natural gas is ready for distribution, through pipelines to utilities, for well repressuring, or for making carbon black. The oil leaving the bottom of the column has absorbed the heavier constituents such as: propane, butane, and natural gasolene. This is so called rich oil and is sent to the stripper. The stripper is similar to the absorber with a source of heat added to boil off the propane, butane, etc., in the oil. The oil leaving the bottom is called lean oil, since it no longer contains any absorbed material.

The mixture of propane, butane, etc., leaves the top of the stripper as a gas. It is liquefied by cooling and joins the compression gasoline to the fractionator. The mixture entering the fractionator contains natural gasoline, butane, propane and even some ethane, and this separation of the mixture into its components is called fractionation. In the fractionator, the mixture is fed into the middle of the column and flows downward. The source of heat in the bottom boils the mixture, and the vapors bubbling up through the liquid are effectively washed by the liquid. The material with the lowest boiling point to be removed in the first fractionator is ethane. Another fractionator separates the LP Gas, the next higher boiling point material, as a product from the top, leaving the heavier material (natural gasoline) to be taken off the bottom. In the event a further separation of the LP Gas into propane and butane is desirable still another fractionator will be required.

Properties

One of the most important properties of LP Gas is probably its *vapor pressure*. If the vapors above the liquid are in equilibrium with the liquid, the pressure exerted by the vapor will depend directly upon the temperature of the liquid. For example, a pan of water will boil at 212°F., here we have both liquid and vapor (steam) in equilibrium. Now clamp a lid on the pan and raise the temperature of the water and we increase the vapor or steam pressure.

Each of the hydrocarbons existing in LP Gas exerts a different pressure at a given temperature. *Figure 3* illustrates this and also shows how the vapor pressure varies with temperature for the different LP Gases. For example, at 25°F., Propane has a vapor pressure of approximately 53#/sq. inch, while at 100°F. its vapor pressure is approximately 192 #/sq. inch.

Another important property of LP Gas in the liquid state is its relatively large co-efficient of expansion. Upon heating, the volume of liquid LP Gas will increase appreciably. It is for this reason that storage tanks are never filled liquid full. An expansion space must be provided above the liquid to permit expansion due to temperature rise. The maximum permissible filling volumes for various temperature and specific gravity products of LP Gases, are usually shown on the liquid gauges on all storage tanks. The standards of the National Board of Fire Underwriters, as covered by Pamphlet #58, set forth the maximum permitted filling density for containers. What is Filling Density? It is defined as the percent ratio of the weight of the gas in a container to the weight of water the container will hold at 60°F. For example, a 30,000

Fig 3 VAPOR PRESSURE OF PURE LIQUEFIED PETROLEUM GASES

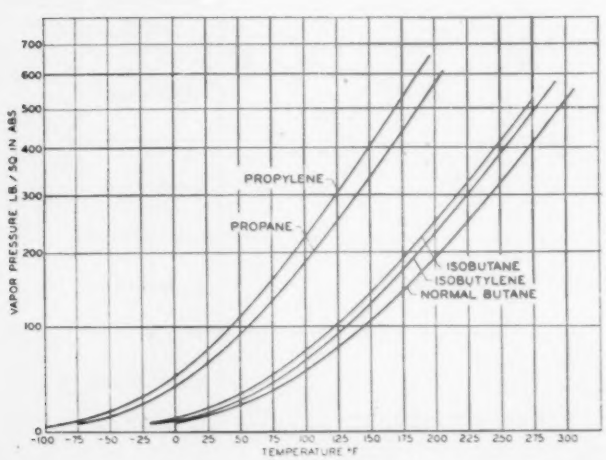
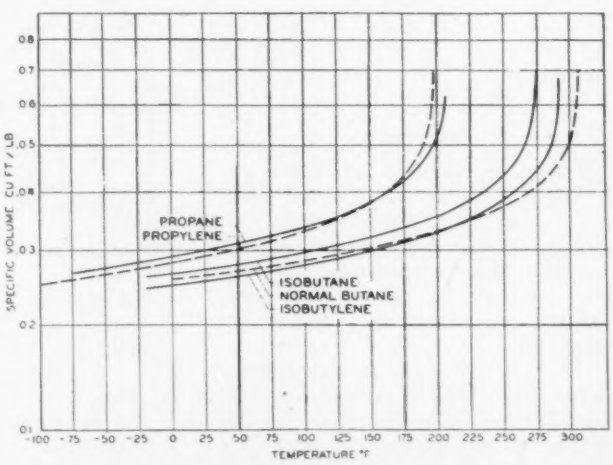


Fig 4 LIQUID SPECIFIC VOLUMES OF PURE LIQUEFIED PETROLEUM GASES



gallon water capacity tank will hold 30,000 gallons or 249,900 lbs. of water at 60°F. The weight of the water times the maximum permitted filling density equals the maximum filling capacity for propane at 60°F., or 249,900 x 45% = 112,500 pounds of propane. 112,500 lbs. divided by 4.24 the weight of propane per gallon equals 26,000 gallons or the maximum filling capacity at 60°F. To say it another way, 112,500 lbs. of propane times, .0316 (the specific volume of the liquid at 60°F.) equal 3560 cubic feet. 3560 cubic feet times 7.48 gallons per cubic foot equals 26,600 gallons.

To digress a moment, let us define specific volume. Specific Volume is defined as the cubic feet occupied by a pound of LP Gas at its equilibrium temperature. *Figure 4* shows the change in volume of liquid LP Gas due to variations in temperature. Here we have specific volume plotted against temperature for various products. Using this curve to give us the specific volume of propane at 121°F., we find that the volume of the 112,500 pounds of propane at 121°F. will be 112,500 times .0356 specific volume x 7.48 gallons per cubic feet equals 30,000 gallons or the tank would be liquid full of propane at 121°F. Since the maximum liquid temperature expected to be encountered as a result of atmospheric heating is about 100°F. it can readily be seen that an ample margin of safety exists between these temperatures.

Frequently reference is made to the greater explosibility or flammability of LP Gas as compared to other gases. The National Board of Fire Underwriters considers LP Gas no more hazardous than manufactured or natural gases. In Table I is given the limits of flammability of most commercial gases and several common hydrocarbons including LP Gases. The lower limit represents the *minimum* percent of gas in air which will support combustion while the higher limit represents the *maximum* percentage of gas in air which will support combustion. It will be noted from the table that the minimum lower limit for any gas is for 1.4% benzene. Carbon Monoxide is 12.5% and has the highest lower limit, and 74.2% is the maximum higher limit for both Carbon Monoxide and Hydrogen, two major components of water gas. On the other hand the maximum higher limit for the LP Gases is 11.1% for propylene. The minimum lower limit for the LP Gases is 1.7% for Butylenes.

Likewise the maximum spread between the lower and higher limits for any of the LP Gases is 9.1% gas in air for propylene.

Compared with the data of LP Gas, the spread between the lower and higher limits for Natural Gas is 9.8%. The spread for Water Gas is 31.3%. From these data it is seen that the limits of flammability are less for LP Gas than for other commercial fuel gases. It is true, however, that the lower limit for LP Gas is lower than other commercial fuel gases, which means that it requires less LP Gas in air to reach the flammable range than for other commercial gases.

The boiling point of a gas is of interest since this is the maximum temperature that the material will exist as a liquid at atmospheric pressure. It will be seen from *Table II* that propylene has a boiling point of minus 53.8°F. while normal butane boils at plus 31.1°F. It is necessary therefore, that if a material is to exist as a gas that its temperature be maintained above its boiling point. The boiling points given in *Table II* are for atmospheric pressure. If the pressure is above atmospheric the boiling points are increased. In *Figure 4A* is shown the dew point curves for butane, propane and mixtures of butane and air. From this curve it is possible to determine the minimum temperature to which a liquefied petroleum gas may be reduced for any particular pressure and not encounter condensation. For example at 10# pressure, Propane will not condense until temperatures below minus 10°F. are reached. Butane at the same pressure will condense at temperatures of plus 50°F. and below.

TABLE I
Limits of Flammability in Air

	Per Cent Gas In Air	
	Lower	*Higher*
Gas	*Limit*	*Limit*
Methane	5.00	15.00
Ethylene	2.75	28.00
Ethane	3.22	12.45
Propylene	2.00	11.10
Propane	2.37	9.50
Butylenes	1.70	9.00
Isobutane	1.80	8.44
n-Butane	1.86	8.41
Natural Gas	4.80	14.60
Coal Gas	5.60	30.80
Carburetted Water Gas	6.40	37.70
Carbon Monoxide	12.50	74.20
Hydrogen	4.00	74.20
Benzene	1.41	6.75

TABLE II
Boiling Points

Gas	*Boiling Point—F*
Methane	—258.9
Ethylene	—154.9
Ethane	—128.2
Propylene	—53.8
Propane	—43.7
Isobutylene	+19.2
Isobutane	+10.9
n-Butane	+31.1
Carbon Monoxide	—313.6
Hydrogen	—422.9

Storage of LP Gas

Because LP Gas can be converted and maintained as a liquid under moderate pressure it is transported and stored in the liquid form. The LP Gas industry has established that under normal storage conditions in large containers the liquid temperature will not exceed 100°F. The maximum vapor pressure of 200 psig at 100°F. for commercial propane has been established as standard by the LP Gas Industry.

The standard storage tank for LP Gas is a code tank constructed under ASME or joint ASME-A.P.I. unfired pressure vessel codes. Above ground, tanks are generally supported on two concrete piers. The question is frequently raised as to the reason for this. From a design standpoint the storage container may be considered as a beam if the tank has been constructed by fusion welding. The beam is adequately supported if only two piers are used.

Storage tanks are equipped with spring loaded relief devices which are installed primarily to take care of any emergency. Experience has shown

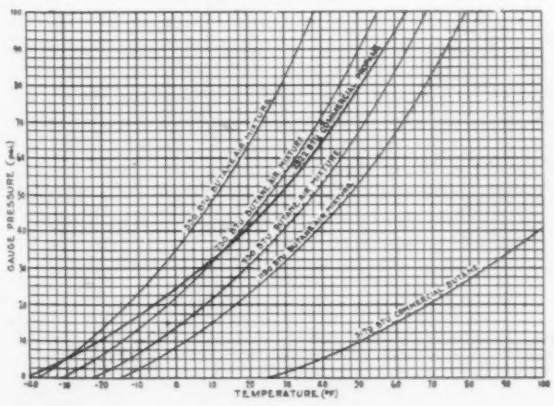


Figure 4A

Dew Point Curves for Butane Air Mixtures, Commercial Butane and Commercial Propane.

that LP Gas is not corrosive to the interior of storage tanks and external corrosion can be controlled by proper painting.

Since the tanks are designed for the maximum vapor pressure expected to be encountered due to the heating of the contents from atmospheric conditions, the primary purpose of the relief valve is to relieve pressure in case of an external fire.

All openings in storage tanks except relief valves, gauging devices and filling connections are equipped with excess flow valves, of the slug type. The slug or valve is held open against the direction of flow by a spring. When the flow past this slug is sufficient to create a pressure differential equal to or greater than the force of the spring the flowing material closes the valve. These valves are designed to close when flow is less than the capacity of the pipe beyond it. If a line is ruptured the escaping material would close the excess flow valve, thereby reducing the quantity of material lost to that contained within the broken line.

Use of LP Gas

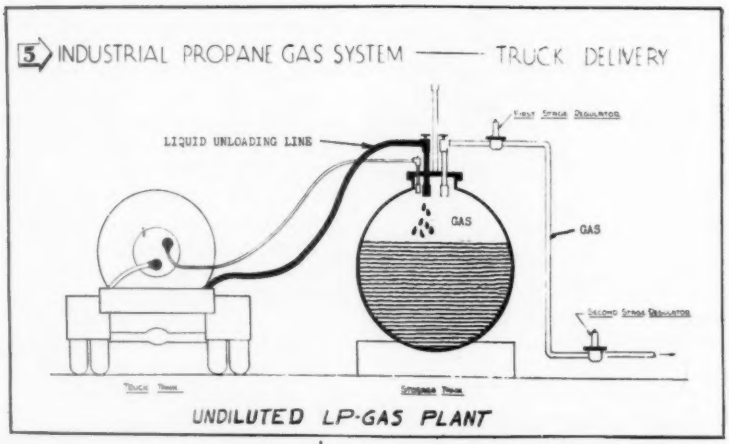
The primary use of LP Gas in industry is for fuel purposes. Two major factors make LP Gas different from other commercial fuel gases, namely a higher heating value and a higher specific gravity. Normal *Butane* has a heating value of 3390 Btu per cubic foot while propane has about 2563 Btu per cubic foot. The specific gravity in the vapor phase of normal butane is 2.08 and of propane is 1.55. Since the gravity of LP Gas is higher than that of air, it has a tendency to seek low places under still air conditions, and it is necessary to provide adequate ventilation wherever there is a possibility of leakage.

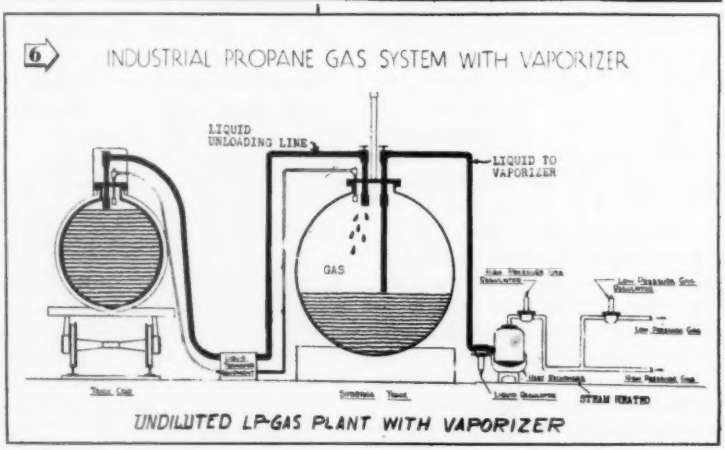
Now let us briefly consider the various ways you might use LP Gas.

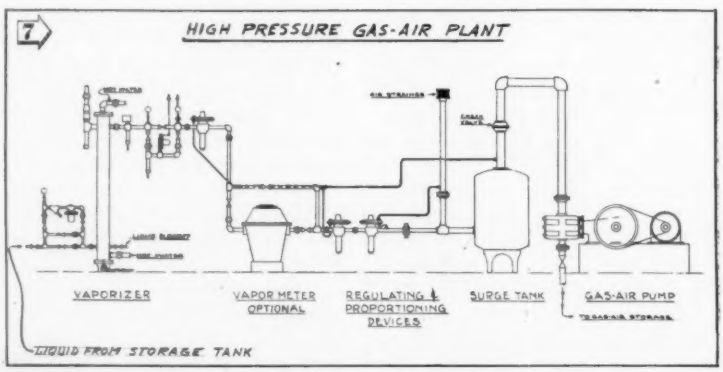
I—Small Undiluted LP Gas Plant

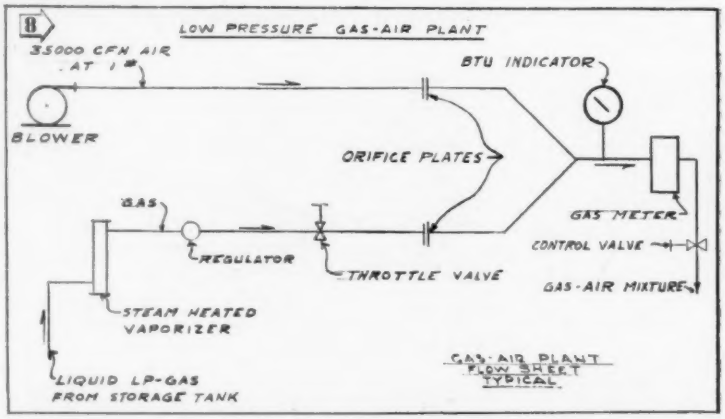
Figure 5, shows a plant where LP Gas in vapor form is withdrawn directly from the top of the storage tank, passed through the necessary regulating equipment and piped to the point of use. This type of plant is very limited in vapor output because it relies on the atmosphere to supply the heat necessary for vaporization. This type of plant is similar to a domestic bottled gas installation.

Let's consider that pan of water again with a lid clamped on it and the pan heated over a burner and 1# of steam generated. The only means of maintaining this steam pressure is to supply sufficient heat to keep the water boiling. Remove the pan from the flame and the steam pressure









drops. And so it is with LP Gas, if sufficient heat for vaporization cannot be obtained from the atmosphere and the vapor withdrawal is heavy it is possible with propane in the storage tank to cool the liquid to a temperature where ice forms on the outside of the tank and the vapor pressure will continue to fall until at minus 44°F., no vapor is generated.

II—Undiluted Plant with Vaporizer

In Figure 6, we have a system where liquid LP Gas is drawn from the storage tank and vaporized in a steam heated heat exchanger. After reducing the pressure of the vapor with suitable regulators, the gas is piped to the point of use. The amount of vapor available from this system is limited only by the capacity of the heat exchanger, and we get an added advantage of a gas with a constant heating value. The vaporizer in this system is nothing more than our familiar pan of water with a flame under it to keep it boiling.

III—Propane Air Plants

There are a number of methods of mixing Propane with air for various uses and *Figures 7 and 8* show two representative methods. *Figure 7* is for a high pressure system and *Figure 8* is a typical low pressure system.

Let's suppose that X Gas Company of New Jersey requires a peak load LP Gas plant capable of delivering 40,000 cfh of 525 Btu propane-air at 1# for 100 peak hours during the winter, the plant to be manually operated. What equipment is required and how much will it cost? The necessary equipment would be one 30,000 gallon gross capacity storage tank, tank accessories such as valves, gauges, relief valves, excess flow valves, etc.; a heat exchanger capable of vaporizing approximately 250 gallons of propane an hour, the necessary regulators, a LP Gas Tank Car Unloading compressor, a centrifugal blower to deliver approximately 35,000 cfh of air at 1#, orifice plates, a Btu indicator, a gas meter, the necessary piping, etc.

We are assuming of course, that the plant has low pressure steam available and a railroad siding for LP Gas delivery. Referring to *Figure 8*, this plant would operate as follows:

The liquid LP Gas is piped from the storage tank to the steam heated, heat exchanger. The LP Gas in vapor form is drawn from the heat exchanger and reduced in pressure through suitable regulators to one (1) #/sq.in., and piped to a simple orifice as the measuring device. This orifice is sized to pass the correct amount of vapor to give a 525 Btu mixed gas. A blower supplies air at 1# to an orifice in the air line and this orifice is sized to give the correct mixing ratio with the gas. The gas and air are mixed at the junction of the two lines and any variations in the mixed gas are picked up by the Btu indicator and adjustment can be made by opening or closing the throttle valve in the gas line. This plant, by the addition of a few controls, can be made just as automatic as you want it.

We might compare this LP Gas plant with the fuel system of an automobile:

The gasoline tank is the LP Gas storage tank.

The carburetor with the aid of exhaust gases vaporizes the gasoline.

The steam heated heat exchanger accomplishes this in the LP Gas plant.

The carburetor also takes in the required amount of air and mixes it with gasoline.

Air for the LP Gas-air mixture is supplied by a blower and is mixed at the junction of the gas and air line as in Figure 8.

The throttle or accelerator regulates the flow of the gasoline-air mixture to the engine.

The control valve in the gas-air line of Figure 8 likewise controls the flow of the gas-air mixture.

The cost of this simple peak load plant installed would be approximately $25,000 and the cost of 525 Btu Propane-air assuming the delivered price of propane to be $0.12 per gallon is approximately 70 cents per 1000 cubic feet. You no doubt think of LP Gas storage as costly, but you must consider that a 30,000 gallon gross capacity storage tank holds the equivalent of approximately 4,500,000 cubic feet of 525 Btu gas. Could you build a 4,500,000 cubic foot holder for $15,000? $15,000 represents the cost of the storage tank, tank accessories, foundations and piping at the tank only. You might compare this with approximately $600,000 the cost of a 4,500,000 cubic foot holder.

There are other ways in which LP Gas can help you, such as:

1. An undiluted propane plant for distribution or enrichment of city gas. *Figure 6* is such a plant.
2. Propane air plants for complete replacement of Water or Coal gas. *Figure 8* is a typical plant.
3. Underfiring of coke ovens.
4. Reforming in water gas sets. Figure 6 would be typical plant.
5. Catalytic Plants.
6. Standby for natural gas.
7. Standby for High Btu Gas. Figure 8 would be such a plant.
8. Bottled Gas for holding the gas load beyond the mains.

Supply and Demand

In 1922, the first year records for the sale of LP Gas are available, the total marketed production of LP Gas was only 223,000 gallons. In 1947, the total marketed production was approximately 1,850,000,000 gallons or an increase of 30 percent over 1946. In 1928, sales to the gas industry were 1,500,000 gallons. In 1947, sales to the gas industry were 135,000,000 gallons, an increase of 55% over the consumption in 1946.

A breakdown of the total marketed production in 1947 shows that 55% went to the Domestic customer, 15.5% went for Industrial users, 7% for Gas manufacturing and 22.5% for the Chemical Industries.

Presented before the 33rd Annual Meeting of the New Jersey Gas Association, September 10, 1948, Spring Lake, N. J.

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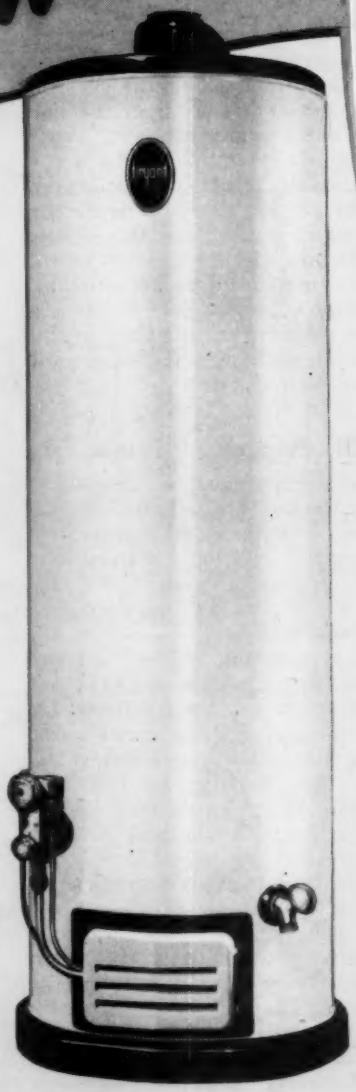

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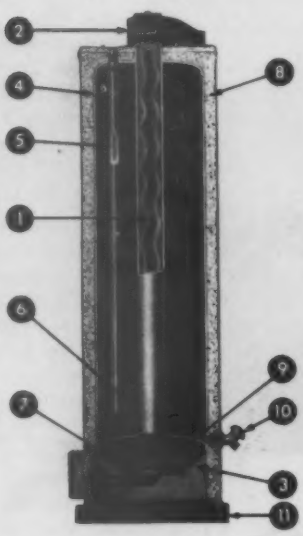
Every phase of water heater design and construction is given this detailed attention at Bryant. Examine these features:

1 EXCLUSIVE! Bryant "Link-Trap" Baffle—suspended in center flue, made in segments to allow withdrawal without disconnecting heater.

2 EXCLUSIVE! Bryant Streamlined Downdraft Diverter—assures proper operation under downdrafts 3 times those handled by conventional draft hood. Cuts installation height 6 to 10 inches.

3 EXCLUSIVE! Bryant Porcelain Enameled Aeration Plate—rust-resistant, reflects heat back into water, maintains low floor temperature, and serves as a primary condensate trap.



4 Extra Heavy Galvanized Steel Tank, designed to withstand 350 lbs. hydrostatic test pressure.

5 Bryant *Protect-O-Rod*—provides cathodic protection, makes possible the Bryant *10-Year Protection Plan.*

6 Grayson *Unitrol* (element only shown) controls water temperature.

7 100% Safety Pilot, in connection with *Unitrol,* shuts off all gas if pilot flame is extinguished.

8 Extra Thick *Fiberglas* Insulation insures minimum heat loss.

9 Cast Iron Burner with raised ports, specifically drilled for type of gas to be used.

10 Drain Cock placed at lowest point of tank for proper drainage.

11 Sturdy One-Piece Steel Base saves height, adds to attractive appearance of heater, eliminates underneath cleaning.

Let the pup be furnace man . . . and water boy, too!

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Free Service—A Problem of Control

By
C. A. Renz

Southern California Gas Co.
Los Angeles, Cal.

Mr. Renz, in his paper presented at the Annual Meeting of Canadian Gas Association at Jasper Park June 30 to July 3, discussed in considerable detail the results experienced by his company on this subject of nation-wide interest. The Journal gives herewith, in extended abstract, most of the highlights of his findings which include results achieved in the training of service men. —Ed.

MY TOPIC, "Free Service—A Problem of Control," suggests that when free service is adopted by a company, some means of control must be considered if the policy is to be properly administered.

You will recall the paper, "Free Service—The Problem Child of the Gas Industry," by Mr. S. F. Baldwin of the Rochester Gas and Electric Company. Mr. Baldwin's discussion received nation-wide interest as most utilities have a service problem child of varying stature. Mr. Baldwin states, "No one person can outline a single plan to fit each company." He believes that the problem is industry-wide and suggests some major topics for discussion that would contribute to a solution.

Capitalizing on Mr. Baldwin's suggestion, I have developed in some detail a few of the topics based on the results experienced in our company.

Development of a Charge Service Policy

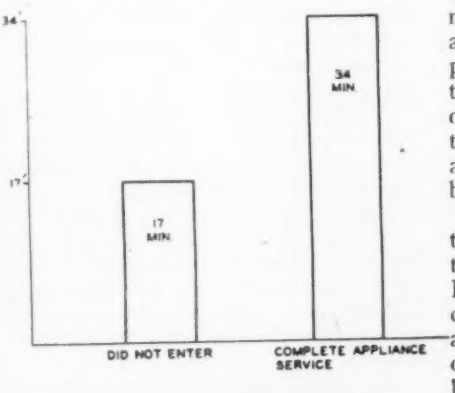
Normal service policies and their resultant costs must be subject to continuous review and control. With utility rates set at rather static levels, variance of the kind and amount of service offered to the customer is one phase of operations that can assist Management in meeting today's rapidly changing economic conditons.

These conditions require sources of accurate information that show the effect of yesterday on today, and predict costs of tomorrow. These sources of information are invaluable in the administration of a free service program, which is primarily a problem of control.

Three necessary controls are (1) records of costs, (2) orders per 1000 meters and (3) man-hours or minutes per order. There are varied ways in which the information may be kept; however, there is no set formula required as long as the data is simple and tells the story. The primary use for this data is reviewing long-term trends, preparing forecasts and planning long-term objectives.

The productivity of labor can influence cost trends as labor cost is normally about 80% of the total cost. The minutes - per - completed - order trend indicated that the increase in minutes per order was not serious. Further analysis was necessary to ascertain if any changes of procedure, or even policy, were possible to control or reduce the trend of increased minutes per completed order.

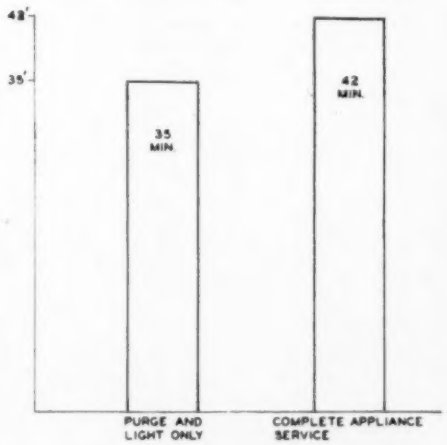
Service requests can be segregated into two general groupings, the first being requests for turn-ons, closes, leaks, high bills and miscellaneous company orders (change meters, trace and tag). This group can be called noncontrollable as a utility is normally obligated to complete this type of order without reservation. The second is comprised of service requests to adjust or repair gas appliances. This group is termed controllable as it is possible if a company desires to curtail, discontinue, or charge for all or a portion of appliance adjustment service.



TIME REQUIRED FOR COMPLETION OF "FOUND ON" TURN ON ORDERS

Figure 1

It is possible to control costs of the noncontrollable items through improved work methods or changes of procedure. To illustrate, Figure 1 reflects the difference in time to complete one of our normal service requests by change of procedure. It was our practice when a customer requested that gas be turned on and the resultant call found the customer not at home, but the gas on, to call back later to complete the request. A study clearly indicated that obtaining the meter read for billing purposes was all that was required. Careful sampling has not brought out any negative customer reaction to this change of procedure. Figure 2 illustrates that by purging and lighting only, the amount of time on the premises can be controlled.



TIME REQUIRED FOR COMPLETION OF TURN ON-REMOVE BLANK SWIVEL ORDERS

Figure 2

Procedures can be varied on controllable orders in the same manner to control or reduce over-all costs. For instance, in the event a utility decides to develop a service charge for all—or a part—of the service requested by the customer (the controllable grouping), it is necessary to review service procedures in considerable detail.

Our recent experience with air

conditioner service is an example. The scope of this paper does not permit including all the details of the development of a service charge; however, a short review of the methods followed will illustrate the general procedures.

It was found that our servicing costs were increasing. In order to determine where the costs could be reduced and what phase of the service costs could be passed on to the customer without adversely affecting customer acceptance of the product, an analysis was made of the following classes of orders:

a. Routine preventive maintenance calls.
b. Call-back calls.
c. Parts replacement calls.
d. Product failure calls.

Routine Preventive Maintenance Calls

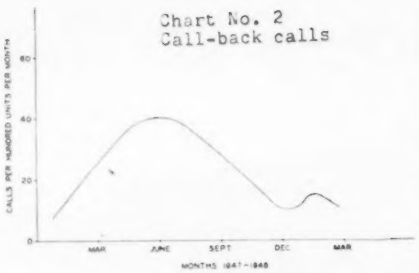
It is impractical to completely eliminate routine maintenance of an air conditioner, since motors must be periodically oiled or greased, cooling tower sumps drained and cleaned, filters cleaned or replaced, and other moving parts (such as fan belts) adjusted and/or replaced from time to time.

A review of the average labor time required to perform a routine check on a simple unit with or without a cooling water tower and including the non-premise time such as driving and office time chargeable to a specific call, as well as any repetitive material expense (such as filters), led to the development of a flat rate package service contract. Unit cost reductions were worked out for multiple installations with the result that each customer has been offered a tailored service and maintenance contract at a reasonable price, which completely covers all out-of-pocket expense to the company.

Call-Back Calls

An analysis of the call-back orders revealed that they could probably be eliminated entirely, since it was found that these calls were made either to replace a defective part discoverd on an initial call or bcause the serviceman felt the need to recheck work performed on an original call to verify the validity of previously made adjustments.

Call-backs to replace defective or worn parts were eliminated by stocking each serviceman's truck with parts so that any replacement from a fuse to a motor could be made on an initial call. Call-backs to verify adjustments decreased as the servicemen's knowledge of the equipment



increased. The downward trend of the curve during the last half of 1947, as shown on Chart #2, illustrates the value of parts-stocking and training in reducing call-back calls.

Parts Replacement Calls

A flat rate table of labor hours required to replace any part on the unit has been developed and customers are to be offered a package price for out-of-warranty part replacements which will cover all company expense of labor time, driving time, car mileage, tax overhead and material, with an appropriate trade-in allowance made for the defective part.

Where a part replacement can be made during the course of a routine preventive maintenance call, the non-premise labor time and automobile mileage costs chargeable to a part replacement call can be deducted from the package price and the savings thus effected passed on to the customer. Our experience to date indicates that the majority of part replacement calls can be expected during the cooling cycle.

Product Failure Calls

During the spring and early summer of 1947, product failure calls due to hydrogen generation increased at a sharp rate. This problem was solved by the manufacturer's engineering staff, by treating generating units in the field with Lithium Nitrate inhibitor. Within two months, calls because of hydrogen generation dropped from over 90 per 100 units per month to one.

Similarly, earlier motor failure problems have been overcome. Boiler float valve assembly problems have been solved by more careful factory craftsmanship. From our experience to date, it appears that by the fall of this year adequate standards of quality of materials and workmanship should result in product failure calls being reduced to an acceptable minimum.

Our experience with the problem of extensive free air conditioning service clearly indicates that by proper administration excessive calls are eliminated and the cost of essential calls can be passed on to the customer. It is important to note that to date no customer has refused such a contract, nor has any customer expressed dissatisfaction with either the cost of the contract or the extent of work performed under the terms of it.

The following basic elements permit control of service costs and can be adapted to any appliance:

a. Recover maintenance costs by signing customers to a service contract.
b. Eliminate call-backs by stocking parts trucks and pre-training service personnel.
c. Recover part replacement costs by billing on time, mileage and material basis.
d. Eliminate product failure calls by cooperating with the manufacturer for the elimination of defective or poorly designed parts.

For example, residential house heating calls may be classified similarly to those for air conditoner calls. If experience dictates that flues or vents should be cleaned and fireboxes tested periodically, and that customers will want pilots opened or closed seasonally, a service and maintenance contract, similar to that for the air conditoner can be readily established. If condensate or gum in the gas warrants more frequent calls for replacement of pilot line filters to prevent pilot outages than might be required for flue and firebox inspections, some of this cost may be recovered by performing this operation during the course of a "paid for" call. Similarly, if parts failures are a major cause for calls, parts stocked on trucks manned by trained personnel will eliminate call-backs and the costs for such calls may be recovered by billing the customer on a time, mileage and material basis.

A manufacturer and dealer-installer program can be set up to solve the problems of defective parts which result in product failure calls. Any program for residential house heating service that parallels our experience with air conditioner service should result in the reduction of out-of-pocket service costs to an acceptable minimum. It does not appear that there is any cause for concern as to adverse customer reaction to gas and gas-fired equipment resulting from the adoption of a program where unit costs for routine maintenance are passed on to the customer through a service and maintenance contract. Our experience with customer acceptance of service and maintenance agreements indicates that this has not been a problem in the air conditioner program and, since unit charges for

all-year air conditoner maintenance are certain to be considerably higher than those for house heating maintenance, customer acceptance can be anticipated.

During the year of 1947, over 800 voluntary reports of appliance malfunctioning were received from our service group. Surveys have indicated that field reports regarding any one appliance problem usually average 3% of the total number of times the problem is encountered, as the same problem is normally not reported more than once by a given serviceman. Therefore, it can readily be seen that an important percentage of man-hours are utilized annually by our company alone in correcting manufacturing errors.

The appliance that is manufactured without defect must be installed and adjusted without error if the goal of customer satisfaction plus reduced servicing costs is to be reached. The appliance dealer must assume his share of responsibility by properly installing the appliance. If the utility is to assume the responsibility of free maintenance, the dealer must cooperate to the extent of placing the appliance in satisfactory operating condition initially. Referring back again to our study of service orders, we discovered that some 9,500 service calls were occasioned in 1947 by a lack of proper follow-through by the dealer. This count revealed that a significant number of man-hours are consumed annually in repairing connection leaks, adjusting flames, or explaining the operation of newly-installed appliances.

In order to ascertain which installers were most in need of training, and also to determine what phases of the installation training should be emphasized, the Employee Suggestion and Field Observation Program channels were utilized. Where service calls were prompted by an unsatisfactory installation, the name of the dealer responsible for the sale was listed on a Field Observation form, together with a description of the conditions found. These dealers were encouraged to bring their installers to training classes where visual instruction was offered through the use of actual props including ranges and cut-away controls.

Accept Our Share of Responsibility in the Field Testing of New Appliances In Order to Surpass Performance of Competitive Equipment

Field testing of new appliances is an important function of the gas utility. We must lend our support to the development of manufacturing techniques which will insure the production of defect-free appliances. A study of field findings reveals that the ratio of difficulties traceable to manufacturing and installation will remain constant in proportion to the number of appliances sold unless a definite interest is indicated by the utility.

To this end, we have in operation an Employee Suggestion and Field Observation Program. This program deals with internal improvements—as do most suggestion programs—and, in addition, outside organizations whose inadequacies result in service calls on recently installed equipment. This phase of the program is divided into two sections, the first of which deals with the manufactured product itself.

Manufacturers in some instances are unable to conduct sufficient field tests to insure the adequacy of the product when subjected to actual usage under the varying conditions encountered in widely spread areas of their sales market. This, in turn, results in appliances reaching the field which in some cases are functionally imperfect or have appurtenances concealed to a point where major disassembly is necessary in order to perform required services. A coordinative program must be developed whereby the responsibility of providing complete customer satisfaction with new appliances will be divided between the manufacturer, the dealer, and the utility.

It is the manufacturer's responsibility to develop an appliance which, in addition to sales appeal, will be free from defects and easily disassembled for service. To encourage this objective, field reports from our service group involving appliance design or servicing problems on new appliances are tabulated. When sufficient reports have been received to indicate a trend, further action is dictated by the type of problem reported. Where the matter is primarily one of assembly error or manufacturing defect, the manufacturer is contacted as soon as possible and the problem discussed. In those instances where the defect involves design, a sample appliance may be thoroughly checked in our company Appliance Testing Laboratory and a detailed report then submitted to the manufacturer with recommendations to overcome the error.

Occasional "Cause of Request for Service" studies can be useful in identifying troublesome items which may be eliminated at their source to effect a reduction in service costs. Studies of this type indicated that it is the minor oversight that creates the volume of service calls on new equipment—a mislocated pilot, an ignition port improperly drilled, a misalignment of some component part.

New equipment in the home is an important event in the life of the home owner. Any defect, no matter how small, will have its effect in dampening the enthusiasm of the purchaser. The range, being the most frequently operated and the most often observed appliance, unfortunately is the highest offender in point of defects reaching the field.

In some instances where a dealer's appliance sales volume is not sufficient to warrant the expense of maintaining an installation department, competent appliance delivery firms are suggested. Preadjustment procedures are suggested for larger dealers as a means of reducing installation time.

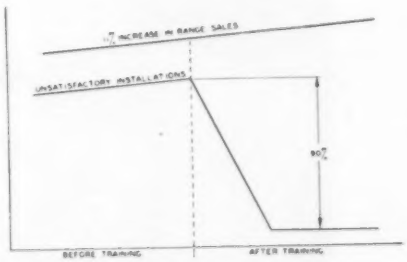


Figure 1

While this program is all-inclusive, figures to date indicate the range to be responsible for the large portion of unsatisfactory installations. Figure 1 illustrates the effectiveness of dealer training as applied to a chain furniture store whose volume of range sales is just above the over-all average. It will be noted that this vendor's unsatisfactory installations dropped 90% in the second half of 1947 after training had been offered.

A study of the field observations involving this firm in Figure 2 revealed that delivery and installation accounted for 63% of the resultant service calls. The remaining 37% were prompted by minor adjustments which the untrained installer could not correct.

Another point of possible interest on this subject, developed through statistical methods by our Quality Control Department, indicates a different approach to this problem. The Quality Control Group of the Customer Service Department constantly samples our service by calling on cus-

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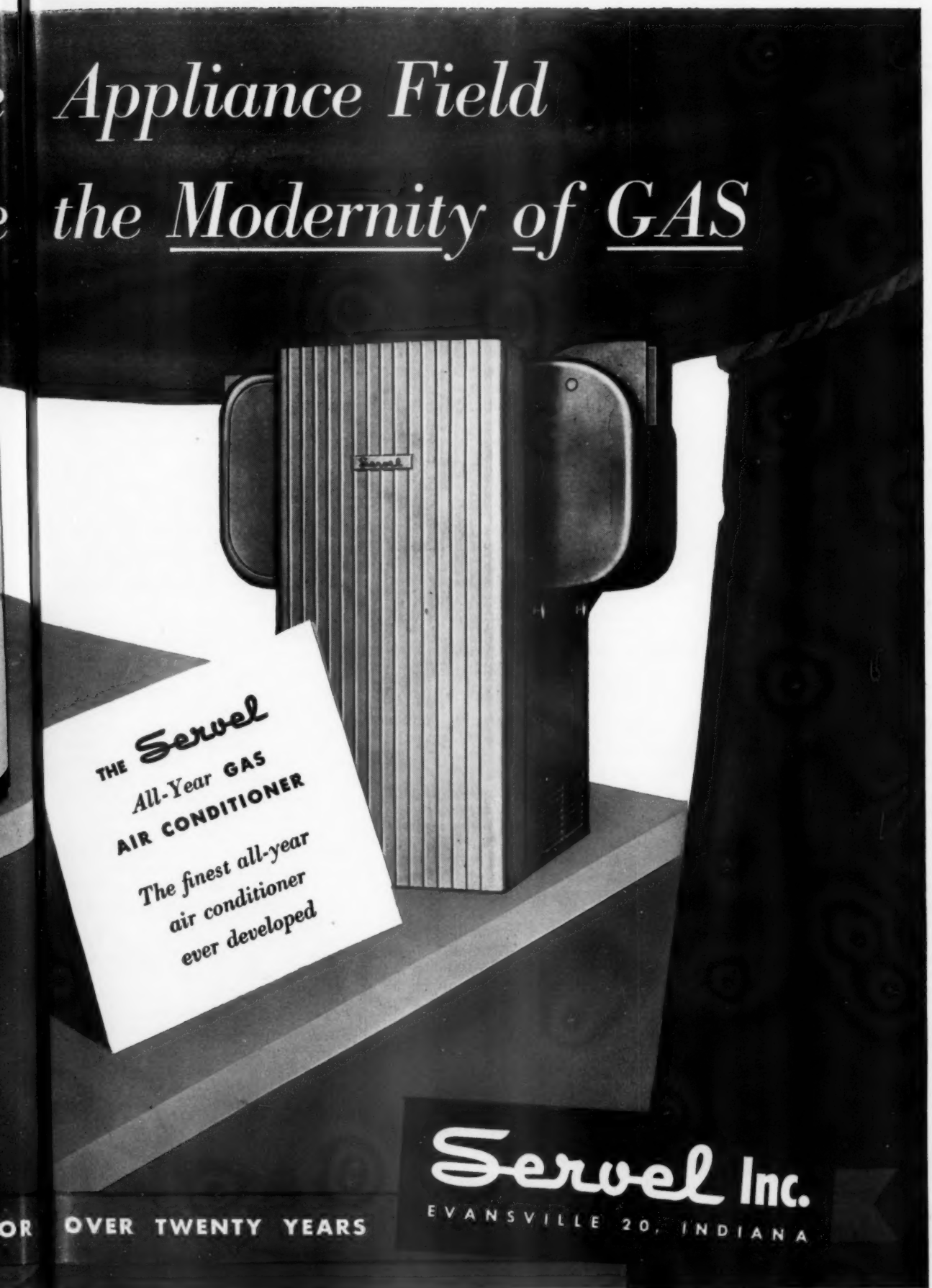
Appliance Field the Modernity of GAS



OR OVER TWENTY YEARS

Serwel Inc.
EVANSVILLE 20, INDIANA

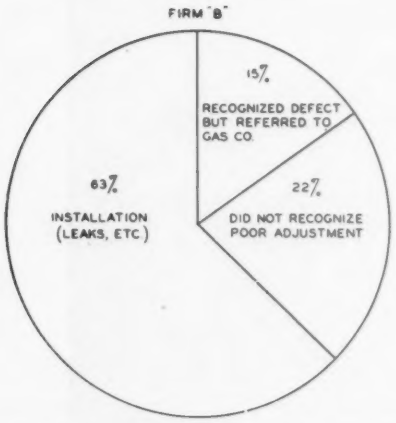


Figure 2

tomers' premises after a request for service has been completed by a serviceman. The information gathered in this manner by Service Inspectors is summarized into various types of reports. Several uses of the information furnished by this group will be mentioned later, but the item relevant to this discussion came to light in the study of approximately 3,000 orders inspected on the customers' premises in which maladjustments on appliances prompting a comment from the customer were tabulated to determine which items on appliances are most critical from the standpoint of customer satisfaction with the service call. One of the minor objectives of the study was to compare the success of three groups of servicemen from the standpoint of the customer's satisfaction with the adjustments performed. The data was broken down to indicate percentage-wise the appliances prompting customer comment about maladjustments. The relatively large percentage of comments involving water heaters on orders worked by servicemen in Group B appeared significantly higher than the identical item on orders worked by servicemen in Groups A and C. A restudy of the data disclosed the following pertinent facts:

a. A large percentage (55%) of the water heater complaints involved overheated water.
b. Most of those complaints were made by customers following the first service call to establish gas service to new homes.
c. Group C servicemen, due to their classification, worked more "Set and Turn-On Meter" orders than the other two groups.

Our original question, "Why the difference between the groups?", had been at least partially answered, but a new question, "Why do new water heaters overheat to the point of affecting a customer's reaction to the appliance?", was still unanswered. The data was broken down further to segregate the different kinds of water heaters involved. The information revealed by that study was rather interesting. Approximately 75% of the cases involved 11 different makes of water heaters, indicating a possible tendency of servicemen in Group B to leave pilots adjusted too high, or thermostats set at a higher than normal temperature. It appears significant, however, that 25% of the cases involved one manufacturer's product. That condition might have been expected had that manufacturer been the most active distributor in the area, but actually, that firm's factory is rather small and has relatively few retail outlets. The discussion of the problem with the Service Inspectors, who are thoroughly experienced servicemen, indicated two possible reasons for that particular water heater to overheat:

a. The position of the pilot in the relation of the automatic shut-off device and the burner requires a higher than normal pilot flame to provide proper ignition and maintain the "Safety" in an open position.
b. The thermostat is constructed in a manner that could result in a sluggish action.

The above points are, of course, inconclusive, but the problem was considered sufficiently important to warrant additional study by our Utilization Engineer. This rather minor project has been treated here in detail, not because of its seriousness as an operating problem, but rather to demonstrate a statistical method of gathering and analyzing data relative to the field performance of new appliances.

Our experience, we believe, permits the following conclusions:

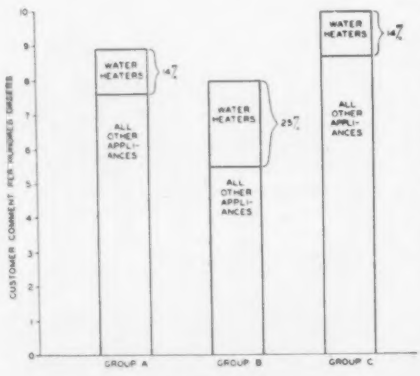


Figure 3

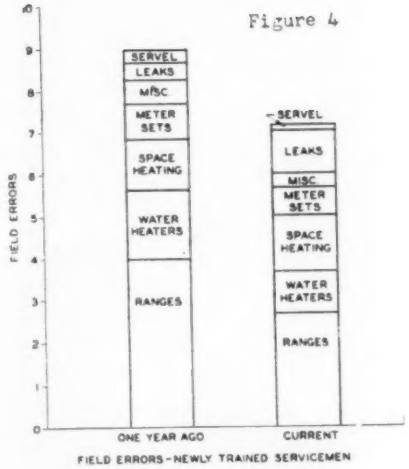
a. Servicing calls on newly-installed appliances can be materially reduced if dealers recognize and accept their responsibilities.
b. Pre-testing of appliances alone is not sufficient.
c. Proper training of the appliance installer and preparation of field trial reports for the manufacturer will lead to a reduction of service costs chargeable to new equipment.
d. Functionally correct equipment, properly installed, will still further convince the customer that his selection was based on sound judgment.

Organization of Training Material Into Proper Sequence

It is customary to think of service work in terms of the type of order executed. To illustrate, we think of a serviceman's work as consisting of various types of orders, such as, turn-ons, closes, meter change orders, customer service orders, etc. But, when we examine those work assignments from the standpoint of skills or knowledge needed for their execution, we find that they consist of a great variety of operations common to all types of assignments. For instance, a turn-on order usually involves meter work, appliance work and clerical work, with many subdivisions under these general headings. From the standpoint of learning, therefore, it is not a separate unit, but a composite of many separate operations that are combined into various patterns in the execution of assignments. It is better, therefore, to organize training material on the basis of the necessary skills required to perform the service work in general, rather than on the basis of type of order executed. This arrangement makes it possible to achieve maximum value from the training time because the subject matter can be arranged in a sequence that promotes quick learning on the part of the inexperienced people.

The segregation of the items inspected on the various pieces of equipment makes it possible to determine within close limits the particular section of the appliance contributing most heavily to the errors. That further breakdown of students' maladjustments on ranges revealed that the range top was the section requiring closest attention with the top burners and top pilots being the focal point of the trouble. The value of this type of information is best illustrated by comparing the chart of a year ago with a similar chart based on data taken from a recent report (See Figure 4). As a result of several course revisions, the total number of field errors by students has been reduced appreciably, with the

Figure 4

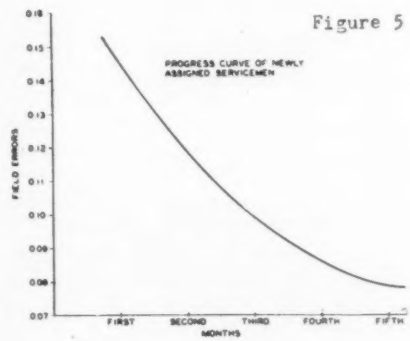


greatest amount of improvement being made on the most troublesome item, the range.

Selection of Qualified Candidates for Upgrading

Through the use of data accumulated through work inspection of recently trained servicemen, it is possible to establish normal progress or learning curves (See Figure 5) showing the relative success of new people in reaching average proficiency on the job. This information is useful to the training group in two ways;

Figure 5



(1) it indicates whether or not the courses are equipping students with the information necessary for their continued development and (2) it serves as a yardstick to determine which people are ready for additional training and upgrading to a classification requiring the execution of more complex assignments. We have found that screening candidates in this manner practically assures successful completion of the advanced course as evidenced by the fact that of the last 145 men who received such training, only one has failed to quality for the more responsible job.

Evaluation of Training Results

Since the major objective of a gas utility's service organization is to promote customer satisfaction with gas appliances, the value of an appliance service training course is ultimately decided by the customer. Records based on several years of work inspection in customers' homes indicate that 98% of the service calls by experienced servicemen are effective from the standpoint of correcting the item prompting the customer

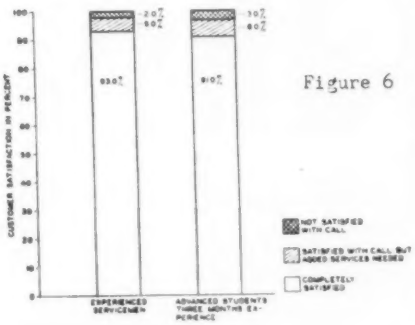

CUSTOMER SATISFACTION IN PERCENT
EXPERIENCED SERVICEMEN
ADVANCED STUDENTS THREE MONTHS EXPERIENCE
NOT SATISFIED WITH CALL
SATISFIED WITH CALL BUT ADDED SERVICES NEEDED
COMPLETELY SATISFIED

Figure 6

request for service (See Figure 6). Included in that 98% is a small group representing 5% of the customers who were satisfied with the call but who made comments to the Service Inspector indicating that the service could have been improved had the serviceman been more thorough in his inspection of all gas equipment on the premises. By comparison, new servicemen with approximately three months' experience working customer complaint type assignments are satisfying the cause of the customer's request on 97% of the orders. Other details prompting customers to comment are found on 6% of their calls. Considering the brief experience of the new men, the relatively small difference in terms of customer satisfaction between the work of the new men and the work of the older employees is a rather positive index of the success of the training course.

The Author acknowledges cooperation of the following members of our Customer Service Department Staff in the preparation of this subject.

C. C. Westmoreland, Quality Control; W. E. Otis, Field Testing Appliances; C. W. Shupp, Cost Control and H. C. Connal, Utilization.

The month of October is Red Feather time in the United States—not by official proclamation nor national edict, but by tradition and common consent. ¶ Nearly a thousand cities and towns will conduct their Community Chest campaigns during this period. ¶ A million volunteers will call on their neighbors, their fellow workmen, their business associates and ask them to provide the funds necessary to keep all the Red Feather services of their home communities in operation for a whole year.

Spread Your Giving:—How much cash do you have in your pocket right now? If you are like most people, it isn't much.

If you were asked to give to one organization for one service, you might be able to reach into your pocket and bring out *enough*. But the Community Chest asks you to give to many-campaigns-in-one for many Red Feather services.

The easy way to give enough is to make a pledge. Sign a card which says you will give so much over a period of time.

When you give . . . give generously . . . enough for all Red Feather services . . . for a *full* year through your Community Chest.

P.C.G.A. 55th Annual Meeting

THE Pacific Coast Gas Association held its 55th Annual Meeting, Sept. 14th, 15th and 16th at Santa Cruz, Calif.

The program committee, with L. Harold Anderson, General Chairman, and J. Q. Abel, F. M. Foster, Henry Honer and R. T. Peterson, prepared an excellent program including a wide diversity of subjects of interest to the industry at this time.

The recreation program included a golf tournament, deep sea fishing and speed boat trips for sightseeing opportunities. There was also a program of entertainment for the visiting ladies.

The newly elected officers for the coming year are as follows:

President—A. F. Bridge, President, Southern Counties Gas Company

Vice President—N. Henry Gellert, President, Seattle Gas Company

Treasurer—D. G. Martin, General Auditor, Pacific Gas & Electric Co.

The Manufacturers Section elected as General Chairman, C. A. Gabriel, President, Monarch Heating Co., General Vice Chairman, T. T. Arden, V. P. Grayson Controls Division Robertshaw-Fulton Controls, Ltd.

The Chairmen of the various divisions are as follows:

Accessories Division: Chairman—J. F. Ray, Sales Manager, General Controls Company. Vice Chairman—J. E. Barrett, Sales Manager, Thermac Company.

Heating Division: Chairman—R. O. Montrief, General Manager, Ward Heater Co. Vice Chairman (So.)—Jas. L. Hess, Sales Manager, Naco Manufacturing Company. Vice Chairman (No.)—Robert Fraser, Fraser and Johnston Company.

Range Division: Chairman—W. M. Couzens, Manager, Gaffers and Sattler, Division Utility Appliance Corporation. Vice Chairman—A. M. Cramer, Engineer, James Graham Manufacturing Co.

Water Heater Division: Chairman—Wayne R. Smith, President, Continental Water Heater Co. Vice Chairman—Howard Ferris, Asst. Director of Sales, Day and Night Manufacturing Company.

Directors G.A.M.A.: C. A. Gabriel and T. T. Arden, with W. M. Couzens and W. R. Smith as alternates.

The following are the new Section Chairmen:

Accounting Section—Chairman, A. T. Kelly, Pacific Gas & Electric Co.

Sales and Advertising Section—Chairman F. S. Parmenter, Southern Counties Gas Co.

Technical Section — Chairman, C. A. Renz, Southern California Gas Co.

Citation for Medal of Honor

In 1926 the gas industry conceived a program of self regulation which in many of its features had no precedent. This program involved the testing of gas appliances to insure that they possessed no features of design or construction which would endanger the safety of the users. To implement this conception required the preparation of specifications, the devising of tests, the invention of test equipment, and the development of a routine fair to all.

Among the many men who worked to further the development of this program was R. M. Conner, then an engineer of the Portland Gas and Coke Company. Mr. Conner had experimented with the testing of gas appliances and had been chosen by the Pacific Coast Gas Association to head a committee to make a study of appliance operation. The report of this committee, as published by the Pacific Coast Gas Association in 1924, became the "Gas Appliance Testing Code," a pioneer work. The Code achieved national recognition, and its authors received the "Committee Award" of the Pacific Coast Gas Association with a Gold Medal to its chairman, Mr. Connor.

Clifford Johnstone
Managing Director P.C.G.A.

With this background it was natural that Mr. Conner should be chosen to direct the formation and operation of the American Gas Association Testing Laboratory. Its growth from an idea to the magnificent and efficient testing and research organization it has become is a tribute to Mr. Conner's management.

In appreciation of the knowledge, diplomacy, and integrity which has thus been devoted to the service of the gas industry, the Board of Directors of the Pacific Coast Gas Association awards its Medal of Honor to Mr. R. M. Conner.

A. F. Bridge

N. Henry Gellert

D. G. Martin

"Fluid" Method of Cracking Oil

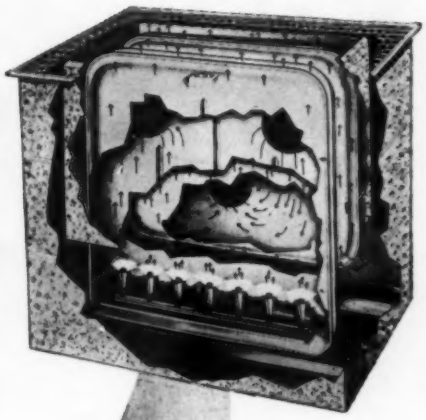
The latest issue of the Kelloggram, issued by M. W. Kellogg Co., Jersey City, N. J., traces the major improvements in fluid "cats" from the first commercial unit at Baton Rouge in 1942 to the latest unit at Montreal which was started up in September. Today's processing techniques—as differentiated from the techniques adopted during the war—are also discussed in this 8-page issue which is abundantly illustrated with photographs of new design changes. Copy sent on request.

Check the FACTS

(NOT CLAIMS)

EMPIRE

Gas FLOOR FURNACES
CIRCULATOR HEATERS



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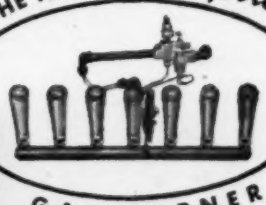

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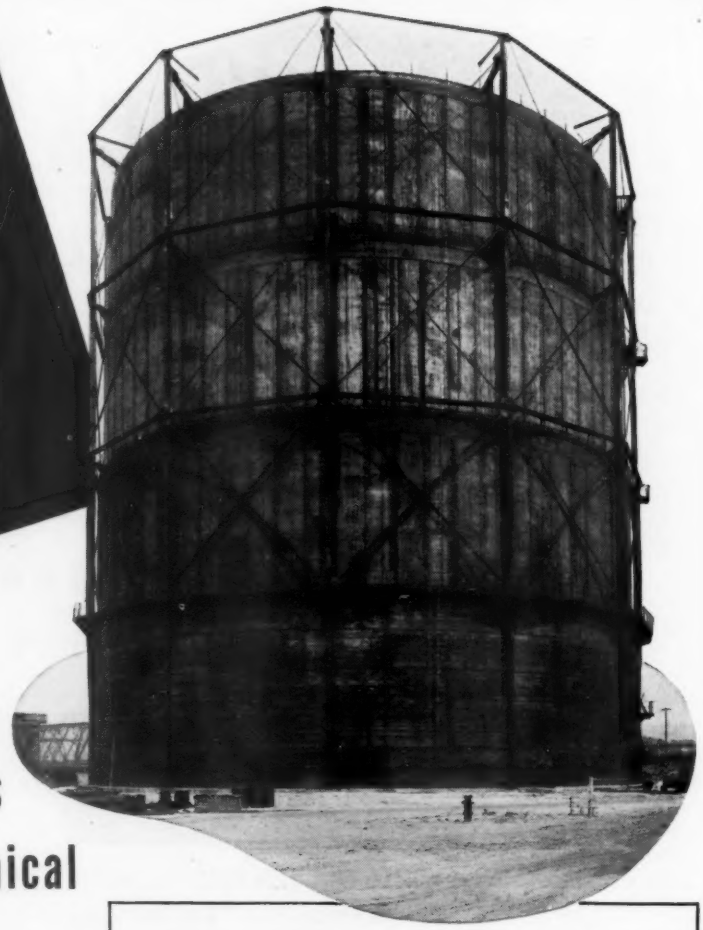

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- Adjustable tank guides on steel tank—insure perfect alignment of contact points for carriages from foundation to top of guide frame.
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- Continuous welding on inside of holder lifts—eliminating corrosion between seams and behind structural members.
- 50% more bottom carriages—for more uniform distribution of carriage loads around perimeter of each holder section.
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- Straight beam simplified top carriage design—eliminating all inaccessible carriage surfaces and corrosion pockets.
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- Newest methods for determining perfectly welded joints.
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Large Volume Water Heating

By

Malcolm B. MacKay

The Burkay Company

REVISED MASS FEEDING HOT WATER REQUIREMENTS

CHAPTER 9 PART 2

In concluding these articles, the author wishes to stress his conviction that the best approach to a solution of the large volume water heating problem is to recognize the fact that our potential customer is laying his money on the line—not, necessarily, for a specific piece of water heating equipment—but for a supply of hot water sufficient to supply his requirements and that—he also has every reason to expect that the hot water will be available in adequate volume *when needed* and at a *uniformly stable temperature.*

This should suggest that we should be primarily concerned with selling hot water service—service that assures our mutual customer *all* the hot water he requires — *when* he needs it—and at a uniformly stable temperature.

There are two, distinct phases of the problem of supplying the hot water requirements of a Restaurant or Commercial or Industrial Establishment.

First, the requirements *must* be accurately forecast or estimated — *not* from the standpoint of daily demand, but on the basis of supplying the hot water at the required rate of flow and in the required hourly volume when needed, regardless of whether the hot water demand ex-

Section A

For determining relative water heater gas input and hot water storage tank capacities where the hot water demand exists at peak level for a single hour only:

A	B	C	D	E
Capacity of Hot Water Storage Tank	Total Hot Water available at required temperature from storage tank to meet hot water demand which may exceed the capacity of the water heater or heaters during any peak period of hot water demand -	Total Hot Water available at required temperature from storage tank to meet hot water demand which may exceed the capacity of the water heater or heaters during a peak hot water demand period of a Single hour, only -	B.T.U. or Heat Content of hot water available Per Hour from storage tank during a peak hot water demand period of a Single hour -	B.T.U. or heat content of hot water available Per Hour from storage tank is equivalent to volume of hot water available - in gallons Per Hour - from a water heater or heaters with rated gas inputs - in B.T.U's. Per Hour - as below. Figures are based on raising the water temperature 100 degrees, F.
100 Gal. Tank	70 Gallons	70 Gallons	58,310 B.T.U's	83,300 B.T.U's / Hour
150 " "	105 "	105 "	87,465 "	124,950 " "
200 " "	140 "	140 "	116,620 "	166,600 " "
250 " "	175 "	175 "	145,775 "	208,250 " "
300 " "	210 "	210 "	174,930 "	249,900 " "
350 " "	245 "	245 "	204,085 "	291,950 " "
400 " "	280 "	280 "	233,240 "	337,200 " "
450 " "	315 "	315 "	262,395 "	374,850 " "
500 " "	350 "	350 "	291,955 "	417,120 " "
550 " "	385 "	385 "	320,705 "	458,150 " "
600 " "	420 "	420 "	349,860 "	499,800 " "
650 " "	455 "	455 "	379,015 "	541,450 " "
720 " "	504 "	504 "	419,832 "	599,760 " "

Section B

For determining relative water heater gas input and hot water storage capacity where the hot water demand exists at peak level for two (2) consecutive hours.

Capacity of Hot Water Storage Tank	Total Hot Water available at required temperature from storage tank to meet hot water demand which may exceed the capacity of the water heater or heaters during any peak period of hot water demand.	Total Hot Water available at required temperature from storage tank to meet hot water demand which may exceed the capacity of the water heater or heaters during a peak hot water demand period of 2 Consecutive hours.	B.T.U. or heat content of hot water available Per Hour from storage tank during a peak hot water demand period of 2 Consecutive hours.	B.T.U. or Heat Content of hot water available Per Hour from storage tank is equivalent to the volume of hot water available - in gallons Per Hour - from a water heater or heaters having rated gas inputs - in B.T.U's. Per Hour - as indicated below. Figures are based on raising water temperature 100 degrees F.
A	B	C	D	E
100 Gal. Tank	70 Gallons	35 Gal. per hour	29,155 B.T.U's	41,650 B.T.U's./ hour
150 " "	105 "	53 " " "	44,149 "	63,070 " "
200 " "	140 "	70 " " "	58,310 "	83,300 " "
250 " "	175 "	88 " " "	73,304 "	104,720 " "
300 " "	210 "	105 " " "	87,465 "	124,950 " "
350 " "	245 "	123 " " "	102,459 "	146,370 " "
400 " "	280 "	140 " " "	116,620 "	166,600 " "
450 " "	315 "	158 " " "	131,614 "	188,020 " "
500 " "	350 "	175 " " "	145,775 "	208,250 " "
550 " "	385 "	193 " " "	164,934 "	235,620 " "
600 " "	420 "	210 " " "	174,930 "	249,900 " "
650 " "	455 "	228 " " "	189,924 "	271,720 " "
720 " "	504 "	252 " " "	209,916 "	299,880 " " M.B.M

FIGURE NO. 15 COMPARATIVE CAPACITY CHART For Recovery Water Heating Systems

For Determining:

1. The required gas input - in B.T.U's per hour - of the water heater where a hot water storage tank of a given capacity is to be employed.

2. The required capacity of the hot water storage tank after the rated gas input of the water heater has been established.

—INSTRUCTIONS FOR USING CHARTS—

1. To determine required, rated gas input of the water heater, proceed as follows:

   a. Determine the peak hour demand- in gallons per hour - and the length of the period of peak demand - in hours - as directed in

      (1) Section 2 of Chapter V for mass feeding hot water demand.
      (2) Section 2 of Chapter V for mass housing hot water demand.
      (3) Section 1 of Chapter VI for industrial processing hot water demand.

   b. Convert the peak hour hot water demand - in gallons - to the equivalent water heating load - in B.T.U's per hour of heater gas input - by multiplying the number of gallons by:

      (1) 714 where water temperature must be raised 60 degrees, F.
      (2) 952 " " " " " " 80 " "
      (3) 1190 " " " " " " 100 " "
      (4) 1428 " " " " " " 120 " "
      (5) 1666 " " " " " " 140 " "
      (above figures reflect a water heating system efficiency of 70%.)

   c. Using the proper chart - depending on the length of the peak demand period - select the size hot water tank which will be employed and read the equivalent water heater gas input - in B.T.U's per hour - on the same line in column "E".

   d. Subtract the figure obtained as directed in 1-c, from the figure obtained as directed in 1-b.

   e. The resulting figure will be the required gas input of the water heater - in B.T.U's per hour.

2. To determine the required size of the hot water storage tank- in gallons - where a water heater of a given, rated gas input is to be employed, proceed as follows:

   a. Determine the peak hour demand - in gallons per hour - and the length of the period of peak demand - as directed in;

      (1) Section 2 of Chapter V for mass feeding hot water demand.
      (2) Section 2 of Chapter V for mass housing hot water demand.
      (3) Section 1 of Chapter VI for Industrial processing hot water demand.

   b. Convert the peak hour hot water demand - in gallons - to the equivalent water heating load - in B.T.U's per hour of heater gas input - by multiplying the number of gallons by:

      (1) 714 where water temperature must be raised 60 degrees, F.
      (2) 952 " " " " " " 80 " "
      (3) 1190 " " " " " " 100 " "
      (4) 1428 " " " " " " 120 " "
      (5) 1666 " " " " " " 140 " "

   c. Subtract the rated gas input - in B.T.U's per hour - of the water heater which is to be employed, from the figure obtained as directed in 2-b.

   d. Using the proper chart - depending on the length of the peak demand period - select the number of equivalent B.T.U's per hour of heater gas input in column "E" - as directed in 2-c - and read the required capacity of the hot water storage tank in column "A".
      (Above figures reflect a water heating system efficiency of 70%)

M.B.M.

ists at peak level for a single hour or for two, or more, consecutive hours.

Secondly, the correct type of water heater or water heating system best suited to supply the specific hot water requirement must be selected and the capacity—both Recovery and Storage—determined. It is in this connection that the importance of providing the correct ratio of water heater Recovery Capacity to hot water Storage Tank Capacity must be recognized as one of the most important factors in determining whether a specific hot water demand will be adequately supplied and whether the hot water will be delivered at a uniformly stable temperature.

It must also be recognized that the *duration* of the period of Peak Hot Water Demand determines this relationship of water heater Recovery to hot water Storage Tank Capacity as explained in detail in Part 2 of Chapter *VI*.

Because of the fact that the *ratio* of water heater recovery capacity to hot water storage tank capacity must, necessarily, be determined by the *length* of the *peak* hot water demand *period* and the correct determination of these relative capacities involves considerable figuring, data on this phase of the large volume water

Section C

For determining relative water heater gas input and hot water storage tank capacities where the hot water demand exists at peak level for three (3), consecutive hours.

Capacity of Hot Water Storage Tank.	Total Hot Water available at required temperature from storage tank to meet hot water demand which may exceed the capacity of the water heater or heaters during any peak period of hot water demand.	Total Hot Water available at required temperature from storage tank to meet hot water demand which may exceed the capacity of the water heater or heaters during a peak hot water demand period of 3 consecutive hours.	B.T.U. or Heat Content of hot water available Per Hour from storage tank during a peak hot water demand period of 3 Consecutive hours.	B.T.U. or Heat Content of hot water available Per Hour from storage tank is equivalent to the volume of hot water available - in gallons Per Hour - from a water heater or heaters having rated gas inputs - in B.T.U's. Per Hour - as indicated below.—Figures are based on raising the water temperature 100 degrees, F.
A	B	C	D	E
100 Gal. Tank	70 Gallons	24 Gal. per hour	19,992 B.T.U's.	28,560 B.T.U's./ hour
150 " "	105 "	35 " " "	29,155 "	41,650 " "
200 " "	140 "	47 " " "	39,151 "	55,930 " "
250 " "	175 "	58 " " "	48,314 "	69,020 " "
300 " "	210 "	70 " " "	58,310 "	83,300 " "
350 " "	245 "	82 " " "	68,306 "	97,580 " "
400 " "	280 "	94 " " "	78,302 "	111,860 " "
450 " "	315 "	105 " " "	87,465 "	124,950 " "
500 " "	350 "	117 " " "	97,461 "	139,230 " "
550 " "	385 "	128 " " "	106,624 "	152,320 " "
600 " "	420 "	140 " " "	116,620 "	166,600 " "
650 " "	455 "	152 " " "	126,616 "	180,880 " "
720 " "	504 "	168 " " "	144,944 "	207,060 " "

Section D

For determining relative water heater gas input and hot water storage capacities where the hot water demand exists at peak level for four (4), consecutive hours.

Capacity of Hot Water Storage Tank	Total Hot Water available at required temperature from storage tank to meet hot water demand which may exceed the capacity of the water heater or heaters during any peak period of hot water demand.	Total Hot Water available at required temperature from storage tank to meet hot water demand which may exceed the capacity of the water heater or heaters during a peak hot water demand period of 4 Consecutive hours.	B.T.U. or Heat Content of hot water available Per Hour from storage tank during a peak hot water demand period of a 4 Consecutive hours.	B.T.U. or Heat Content of hot water available Per Hour from storage tank is equivalent to the volume of hot water available - in gallons Per Hour - from a water heater or heaters having rated gas inputs - in B.T.U's, Per Hour - as indicated below. Figures are based on raising the water temperature 100 degrees, F.
A	B	C	D	E
100 Gal. Tank	70 Gallons	18 Gal. per hour	14,994 B.T.U's	21,420 B.T.U's./ hour
150 " "	105 "	26 " " "	21,658 "	30,940 " "
200 " "	140 "	35 " " "	29,155 "	41,650 " "
250 " "	175 "	44 " " "	36,652 "	52,360 " "
300 " "	210 "	53 " " "	44,149 "	63,070 " "
350 " "	245 "	61 " " "	50,813 "	72,590 " "
400 " "	280 "	70 " " "	58,310 "	83,300 " "
450 " "	315 "	79 " " "	65,807 "	94,010 " "
500 " "	350 "	88 " " "	73,304 "	104,720 " "
550 " "	385 "	96 " " "	79,968 "	114,240 " "
600 " "	420 "	105 " " "	87,465 "	124,950 " "
650 " "	455 "	114 " " "	94,962 "	135,660 " "
720 " "	504 "	126 " " "	104,958 "	149,940 " "

Note - Where the hot water demand continues at peak level for five (5), or more, consecutive hours, the recovery capacity of the water heater, or heaters, should equal the peak hour hot water demand while the hot water storage tank need have only sufficient capacity to supply a required volume of hot water which may exceed the recovery capacity of the heater during a short, heavy peak demand period.

M.B.M.

heating problem has been prepared and has been incorporated in a chart or table.

This Chart—Figure No. 15—will supplement the Recovery Water Heating Sizing Chart—Figure No. 13—which will be found in Part 2 of Chapter *VIII*. It also will supply the following information *after* the Peak Hour Hot Water Demand and the *Duration*, or Length of the *peak demand period, in hours*, have been determined as directed in Part 2 of Chapter *V* and in Part 1 of Chapter *VI*:

(a) The Required Recovery Capacity of the water heater or heaters may be read directly from this chart where an existing hot water storage tank having a given capacity is installed or where limitations of space restrict the size of the tank.

(b) The Required Hot Water Storage Tank Capacity may be read directly from the chart where an existing water heater or heaters are available for use.

All figures shown in this chart reflect the following operating conditions:

(a) A Thermal Efficiency 70% for the water heater or heaters.

(b) The Availability of 70% of the contents of the hot water storage tank for supplying a portion of a Peak Hot Water Demand which may exceed the Recovery Capacity of the water heater or heaters as explained in Part 2 of Chapter *VI*.

If the information covering Large Volume Water Heating Problems, or the data on the subject of determining large volume hot water requirements or demand, and on capacitating Large Volume Water Heating Systems to supply that demand, has served to simplify the reader's approach to a clearer conception of the subject, the author will feel that the effort and time expended in developing, accumulating and compiling the informative material and other data presented in these articles have been amply justified.

SIZING CHART -- FIGURE NO. 13 -- SIZING CHART

FIGURES SHOWN FOR THE REQUIRED WATER HEATER GAS INPUT -- IN B.T.U's. PER HOUR -- AND THE SIZE OF THE HOT WATER STORAGE ARE BASED ON CORRECT PROPORTIONING OF INPUT TO STORAGE CAPACITY UNDER VARYING CONDITIONS OF PEAK DEMAND AND TEMPERATURE RISE.

REQUIRED WATER HEATER GAS INPUT AND HOT WATER STORAGE TANK CAPACITIES -- RECOVERY WATER HEATING SYSTEMS

A HOT WATER DEMAND CHARACTERISTICS		B WHERE WATER MUST BE RAISED 60° F.		C WHERE WATER MUST BE RAISED 80° F.		D WHERE WATER MUST BE RAISED 100° F.		E WHERE WATER MUST BE RAISED 120° F.		F WHERE WATER MUST BE RAISED 140° F.	
WHERE THE PEAK DEMAND FOR HOT WATER EXISTS FOR A SINGLE HOUR, ONLY, AND THE PEAK HOUR DEMAND IS —	TOTAL VOLUME OF HOT WATER REQUIRED IN THE 1 HOUR PERIOD WILL BE-	REQUIRED WATER HEATER GAS INPUT- ϕ IN B.T.U's. PER HOUR	REQUIRED SIZE OF HOT WATER STORAGE TANK- *MINIMUM	REQUIRED WATER HEATER GAS INPUT- ϕ IN B.T.U's. PER HOUR	REQUIRED SIZE OF HOT WATER STORAGE TANK- *MINIMUM	REQUIRED WATER HEATER GAS INPUT- ϕ IN B.T.U's. PER HOUR	REQUIRED SIZE OF HOT WATER STORAGE TANK- *MINIMUM	REQUIRED WATER HEATER GAS INPUT- ϕ IN B.T.U's. PER HOUR	REQUIRED SIZE OF HOT WATER STORAGE TANK- *MINIMUM	REQUIRED WATER HEATER GAS INPUT- ϕ IN B.T.U's. PER HOUR	REQUIRED SIZE OF HOT WATER STORAGE TANK- *MINIMUM
200 GALLONS	200 GALLONS	65,000	150 GALLONS	88,000	150 GALLONS	109,000	150 GALLONS	132,000	150 GALLONS	153,000	150 GALLONS
250 "	250 "	104,000	150 "	139,000	150 "	172,000	150 "	206,000	150 "	239,000	150 "
300 "	300 "	123,000	200 "	163,000	200 "	205,000	200 "	247,000	200 "	290,000	200 "
350 "	350 "	108,000	300 "	142,000	300 "	180,000	300 "	216,000	300 "	253,000	300 "
400 "	400 "	120,000	350 "	158,000	350 "	198,000	350 "	238,000	350 "	278,000	350 "
500 "	500 "	142,000	450 "	188,000	450 "	238,000	450 "	275,000	450 "	332,000	450 "
600 "	600 "	192,000	500 "	254,000	500 "	320,000	500 "	385,000	500 "	450,000	500 "
700 "	700 "	270,000	500 "	353,000	500 "	450,000	500 "	534,000	500 "	630,000	500 "
800 "	800 "	290,000	600 "	385,000	600 "	490,000	600 "	589,000	600 "	689,000	600 "
900 "	900 "	370,000	600 "	490,000	600 "	615,000	600 "	740,000	600 "	864,000	600 "
1,000 "	1,000 "	445,000	600 "	580,000	600 "	740,000	600 "	890,000	600 "	1,040,000	600 "
WHERE THE PEAK DEMAND FOR HOT WATER EXISTS FOR 2 CONSECUTIVE HOURS AND THE PEAK HOUR DEMAND IS —	TOTAL VOLUME OF HOT WATER REQUIRED IN THE 2 HOUR PERIOD WILL BE-										
200 GALLONS	400 GALLONS	100,000	200 GALLONS	132,000	200 GALLONS	166,000	200 GALLONS	196,000	200 GALLONS	234,000	200 GALLONS
250 "	500 "	110,000	300 "	147,000	300 "	186,000	300 "	223,000	300 "	260,000	300 "
300 "	600 "	134,000	350 "	178,000	350 "	225,000	350 "	270,000	350 "	315,000	350 "
350 "	700 "	142,000	400 "	241,000	400 "	270,000	400 "	322,000	400 "	380,000	400 "
400 "	800 "	155,000	450 "	244,000	450 "	308,000	450 "	370,000	450 "	432,000	450 "
500 "	1,000 "	262,000	450 "	345,000	450 "	435,000	450 "	524,000	450 "	613,000	450 "
600 "	1,200 "	325,000	500 "	430,000	500 "	540,000	500 "	655,000	500 "	768,000	500 "
700 "	1,400 "	400,000	500 "	530,000	500 "	670,000	500 "	810,000	500 "	948,000	500 "
800 "	1,600 "	455,000	600 "	600,000	600 "	760,000	600 "	910,000	600 "	1,068,000	600 "
900 "	1,800 "	530,000	600 "	700,000	600 "	890,000	600 "	1,060,000	600 "	1,235,000	600 "
1,000 "	2,000 "	580,000	700 "	768,000	700 "	970,000	700 "	1,160,000	700 "	1,363,000	700 "
WHERE THE PEAK DEMAND FOR HOT WATER EXISTS FOR 3 CONSECUTIVE HOURS AND THE PEAK HOUR DEMAND IS —	TOTAL VOLUME OF HOT WATER REQUIRED IN THE 3 HOUR PERIOD WILL BE-										
200 GALLONS	600 GALLONS	100,000	300 GALLONS	132,000	300 GALLONS	166,000	300 GALLONS	196,000	300 GALLONS	279,000	300 GALLONS
250 "	750 "	138,000	300 "	182,000	300 "	230,000	300 "	278,000	300 "	325,000	300 "
300 "	900 "	170,000	400 "	212,000	400 "	268,000	400 "	322,000	400 "	380,000	400 "
350 "	1,050 "	178,000	500 "	235,000	500 "	295,000	500 "	353,000	500 "	415,000	500 "
400 "	1,200 "	215,000	500 "	285,000	500 "	360,000	500 "	430,000	500 "	505,000	500 "
500 "	1,500 "	275,000	600 "	365,000	600 "	460,000	600 "	539,000	600 "	650,000	600 "
600 "	1,800 "	348,000	650 "	455,000	650 "	573,000	650 "	678,000	650 "	820,000	650 "
700 "	2,100 "	415,000	650 "	536,000	650 "	705,000	650 "	830,000	650 "	990,000	650 "
800 "	2,400 "	490,000	700 "	648,000	700 "	815,000	700 "	950,000	700 "	1,139,000	700 "
900 "	2,700 "	560,000	700 "	730,000	700 "	940,000	700 "	1,138,000	700 "	1,371,000	700 "
1,000 "	3,000 "	630,000	750 "	835,000	750 "	1,064,000	750 "	1,268,000	750 "	1,480,000	750 "
WHERE THE PEAK DEMAND FOR HOT WATER EXISTS FOR 4 CONSECUTIVE HOURS AND THE PEAK HOUR DEMAND IS —	TOTAL VOLUME OF HOT WATER REQUIRED IN THE 4 HOUR PERIOD WILL BE-										
200 GALLONS	800 GALLONS	112,000	300 GALLONS	147,000	300 GALLONS	196,000	300 GALLONS	222,000	300 GALLONS	260,000	300 GALLONS
250 "	1,000 "	138,000	400 "	182,000	400 "	230,000	400 "	278,000	400 "	325,000	400 "
300 "	1,200 "	170,000	500 "	212,000	500 "	268,000	500 "	322,000	500 "	380,000	500 "
350 "	1,400 "	188,000	600 "	250,000	600 "	312,000	600 "	378,000	600 "	443,000	600 "
400 "	1,600 "	228,000	600 "	300,000	600 "	368,000	600 "	455,000	600 "	535,000	600 "
500 "	2,000 "	360,000	650 "	390,000	650 "	492,000	650 "	590,000	650 "	682,000	650 "
600 "	2,400 "	375,000	650 "	490,000	650 "	645,000	650 "	745,000	650 "	872,000	650 "
700 "	2,800 "	490,000	700 "	580,000	700 "	775,000	700 "	880,000	700 "	1,031,000	700 "
800 "	3,200 "	520,000	700 "	688,000	700 "	923,000	700 "	1,009,000	700 "	1,211,000	700 "
900 "	3,600 "	590,000	750 "	740,000	750 "	950,000	750 "	1,134,000	750 "	1,340,000	750 "
1,000 "	4,000 "	670,000	750 "	895,000	750 "	1,112,000	750 "	1,338,000	750 "	1,540,000	750 "

* STORAGE TANK CAPACITIES SHOWN ARE MINIMUM. WHEN USING A STANDARD STOCK TANK, SELECT THE NEXT LARGER SIZE.

ϕ FIGURES SHOWING THE REQUIRED WATER HEATER GAS INPUT -- IN B.T.U's PER HOUR -- REFLECT AN OVER-ALL EFFICIENCY OF THE WATER HEATING SYSTEM OF 65%.

WHERE THE PEAK DEMAND FOR HOT WATER EXISTS AT THE SAME HIGH RATE FOR MORE THAN 4 CONSECUTIVE HOURS, THE RECOVERY CAPACITY OF THE HEATERS SHOULD EQUAL THE PEAK HOUR DEMAND, WHILE THE HOT WATER STORAGE TANK NEED BE ONLY OF NOMINAL SIZE AS IT BECOMES ONLY A STABILIZING MEDIUM HAVING SUFFICIENT RESERVE TO MEET PEAK HOT WATER DEMANDS WHICH MAY EXCEED THE HEATER RECOVERY CAPACITY DURING RELATIVELY SHORT PERIODS. N.B.M.

THE SAFEST WAY TO...

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..OF DOMESTIC Hot Water Tanks

is by using...

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No. 40L	No. 54X	No. 31L	No. 301L	No. 540C
Self-closing T. & P. Relief Valve. Size ¾"	Fuse plug type T. &. P. Relief Valve with extension. Sizes ½" and ¾"	Diaphragm type T. & P. Relief Valve with fuse plug. Sizes ½" and ¾"	Same as 31L except in Sizes 1", 1¼", 1½", and 2".	Calibrated style fuse plug type T. & P. Relief Valve. Sizes ½" and ¾"

TESTS HAVE PROVEN TRUE CAUSE.. **EXCESSIVE TEMPERATURE**
Even under normal pressure

PHOTO TAKEN AT RECENT TEST
JUNE 14, 1948

In all cases of explosions such as these, *over-heating or excessive temperature is the direct cause of explosive force.*

Prevent water temperature in excess of 212°, and there *cannot* be an explosion.

Plain pressure relief cannot prevent over-heating or reduce temperature.

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A Balanced Fuel Economy

By
Gardiner Symonds
President Tennessee Gas Transmission Co.
Houston, Texas

IN MY COMPANY we call gas measurement the "Cash Register" which gives you some idea of how we feel about it. Measurement is a vital phase of the operations of any company. Unless we can gauge accurately the gas going through our sales and purchase meters we will soon be out of business.

Therefore, it is with a great deal of satisfaction that we see our measurement men voluntarily coming together in this school. Progress through such initiative is characteristic of the natural gas industry. In no phase of our business is this charactertistic more marked than in gas measurement. Men in many companies have developed new techniques—they have improved on old practices in striving for perfection. By pooling your experiences and knowledge you have arrived at a degree of accuracy that makes the 2% tolerance old-fashioned, indeed.

Our Tennessee Gas system is lucky from a school standpoint. We are sandwiched in between two very good schools that are among the few in the country that stress the training of men for natural gas careers. One is here in West Virginia. The other one is the Texas College of Arts and Industries at Kingsville very near the extreme southwestern end of our line. Hence, we have the benefit of the brains and research of both your schools and your cooperation in furthering the training of our personnel.

Like all schools, this Morgantown meter school has values that go beyond the book. Here you meet men of similar interests. Here you have an opportunity to discuss freely your ideas and problems with equipment men. And, here, too, you get an over-all picture of the vast industry in which you play so important a role.

Pioneer natural gas men here in the Appalachian area created natural gas companies as we know them today. Men in this audience and men with whom we associate daily have improved on these early practices and have developed new ones of their own.

Presented at the Eighth Annual Appalachian Gas Measurement Short Course, School of Mines, West Virginia University, August 30 to September 1, 1948.

With this great historical background it is particularly pleasing that you have asked me, a newcomer and a Texan, to speak to you on some phase of that industry.

Texas, a storehouse of natural energy, is still young as far as the natural gas industry is concerned. But the unprecedented demand for natural gas and natural gas products has pulled the Southwest into the public eye.

A large part of this demand is coming from the Appalachian area. It was apparent in the early years of the war that your gas production could not supply the heavy demand of your war industries. It was this war-time demand that brought about the birth of my Company, so we feel that our primary allegiance is to the Appalachian distributors. And we think that we have made an effort that is almost super-human in order to supply gas and more gas to your mains.

Faced with such a seller's market it is sometimes difficult to suppress a certain latent selfishness. There is the temptation for us to slap each other on the back and say, "This is what we've been waiting for." And I am sure the distribution companies have had to suppress the same feeling.

One of my purposes here today is to throw cold water on such an attitude. It is true that we must make profits to exist, but there are other considerations with a higher priority than profits.

"Public Utilities" and "In the Public Interest"

You are fully aware of the expressions "Public Utilities" and "In the Public Interest." Most of you are public utilities in fact, and all of us are public service companies at least morally. We are dealing with a great natural resource that belongs to all the people. They gave us certain monopolies in order to prevent competition that could lead only to bankruptcy and chaos.

In return, we have a great responsibility to the people—not to Texans, nor Tennesseans, nor West Virginians, but to all the people. And you only have to look at today's headlines to realize that the gas business and all businesses, for that matter, must meet these responsibilities head on. We must do a better job of meeting them than anyone else in the world. We who have a public trust must do our jobs so well and so efficiently that there can be no cause for complaint.

You in the retail gas business are most aware of your responsibility to the consumer. He is the fellow who lives next door to you. who depends upon you for his household gas; he is the man down the street who operates a little bakery; he is the company downtown that runs a steel mill; he is the man you see every day and the man most likely to button-hole you when he is provoked.

If you think this neighbor can better cook his food with gas than with coal, then it is your responsibility to see that he has gas. If gas is the best fuel for a bakery, then the bakery should have gas. If there are certain operations in the steel mill that require gas, then the mill should have a gas supply. We must give each consumer the fuel best suited for his needs and his pocket-book. We must not only supply him with this fuel today. We must conduct our business to insure that his children and his grandchildren can also enjoy the comforts of natural gas.

There is another person to whom we have a responsibility. He is the man down in Texas and Louisiana, or here in West Virginia, who finds this gas, produces it, cleans it up and sends it on its way to the consumer.

Natural Gas Being Wasted

In the Southwest today large quantities of natural gas are being wasted due to the lack of a market. By "lack of a market" I mean just that. Unless you can produce, gather and sell gas at a profit you have no market regardless of how many people want it here in the East.

In Texas oil field operations right now a billion and a half cubic feet of natural gas are being flared every day chiefly because the price is not high enough to allow the producer to gather his gas and take it to a pipeline. As long as this situation exists none of us in the fuel business can rightfully look our customers in the eye and say, "We are taking care of your interests."

This waste is not limited to the Southwest; you had the same situation in the Appalachian area until economics allowed you to clean it up. You had your gas flares, too, and it was standard practice to pop gas into the air in order to reduce pressure on pipelines. We understand that at least one steel mill used the pressure of natural gas to operate steam engines and the natural gas at reduced pressure was exhausted to the atmosphere. Because natural gas was cheap, it was used crudely in industry. This very crudeness made it unpopular with workmen responsible for producing high standard products. So unpopular did gas become, largely because of these wasteful practices, that the highest quality steels were heated with coal in preference to gas. Not only was there a physical waste of millions of cubic feet of natural gas, there was also an economic waste. Industry did not get from gas the results in could have obtained with better planning.

As the natural gas industry in the Appalachian area developed, this waste was eliminated. It was done when far-sighted management developed new markets for gas away from the areas where gas was a glut and, therefore, valueless. First, communities near gas wells, and later large but isolated areas, were served by integrated systems from local gas fields. As the art of transmission developed and as gas increased in popularity, these isolated areas were connected together and tied into new sources of supply. Eventually, networks of pipelines reached cities hundreds of miles from the wells and natural gas became a regional rather than a local resource. As the market for natural gas increased, its value became greater and producers and industrial users found they could not afford either a physical waste of natural gas or the economic waste resulting in its improper use.

As new markets developed, relative fuel prices reflected relative value. For the Appalachian home natural gas was priced at a level that encouraged year-round uses. Rates were set for industry that encouraged superior uses but discouraged economic or physical waste. Underground storage was developed to make it possible to sell gas profitably to customers willing to pay for the convenience of gas space heating, but who could not afford luxury prices. We might say that the Appalachian area developed a balanced fuel economy. To emphasize, your efforts and economic forces have brought about a balanced fuel economy.

The Appalachian Area

I spent considerable time while writing this speech trying to define the Appalachian area. I found that there is a great deal of difference between the Appalachian geographical area and the Appalachian market area. I also found that the Appalachian area market-wise has been growing steadily in the last 20 years.

It has grown so great that it can no longer be supplied from Appalachian production. It has been growing because of the increasing natural gas requirements of areas accustomed to natural gas. But you have also continued to meet your obligations by making natural gas available to communities adjacent to the territories that you have been serving. Radial natural gas lines have been extended to the Great Lakes and to the Atlantic Seaboard. As a result of this extension of markets, the Appalachian geographical area today is the center of a larger, more populous area that for convenience, we call the Appalachian market area. This market area extends from Washington and the vicinity of New York City on the east to the Great Lakes on the north, and to the Ohio Indiana state line on the west. This is one of the world's great centers of heavy industry. And you are doing a public service of the highest order by serving it.

Transmission Company Responsibilities

A transmission company has responsibilities that differ in detail but not in principle from those in your companies. Your responsibilities extend outward from your centers of operation. Ours might be said to extend principally in one direction, Northeast. Our responsibility is to make it possible for you to give your present customers and your new custobers adequate service. Moreover, we must make natural gas available to areas beyond those which might be reached by a radial expansion of your networks.

We in the Southwest are under constant pressure to increase our gas supplies to the Appalachian area. This, we are happy to do. You are our best customers and we could make a good living for the rest of my life by settling down and pumping gas steadily to the Appalachian area. It would be the easy way if we could keep our conscience quiet. We could encourage you people to convert every possible fuel user to straight natural gas, regardless of whether this customer operate an annealing furnace or a stationary boiler. This would put an end to the exhausting business of seeking new markets, of wrangling with opposition attorneys in Washington. It would be a relief not to have to lie awake at night worrying about new pipe, new gas supplies and new rights-of-way. There could be time to play golf, to go fishing, to see more of our families.

But we are driven by the ever-present questions, "Is it in the public interest"? and "Are we doing the very best job we can?" We have a superior fuel for many uses. We can come into the very heart of the coal country and convince even the coal people that they should convert to gas for their cooking, their water heating and the many other specialized uses for which gas is so fortunately adapted. We also sell gas in the heart of the TVA country where electricity is cheap and plentiful.

But, I know and you know that we as a nation have fuel requirements where coal and electricity can do the job as well as natural gas. It is our duty to preserve this balance to the best of our ability. We can make life easier for the coal miner's wife by putting a gas range in her kitchen, but we can also destroy her husband's job and seriously disrupt the economy of her area by forcing in gas where coal could do the job.

So, what should Tennessee Gas do?

Should we attempt to saturate the Appalachian area thoroughly even though it means a prostitution of our superior fuel under boilers? Or should we go hunt a new market—a new market where homes and businesses are suffering from the lack of benefits natural gas can give them?

I think we have done a good job of augmenting your supply of natural gas from your own fields. The capacity of our system has been more than doubled since 1944, and soon will be three times that of the original line. Next year we will deliver you from our system about 200 billions of cubic feet of natural gas. If applications before the Federal Power Commission are approved, our 1951 deliveries to you will be at the rate of more than 300 billions of cubic feet per year. In addition to our system, two others deliver Southwest natural gas to the Appalachian area and a fourth system is proposed. If all of the present plans of the various companies are carried through, gas from the Southwest will be flowing into this area at the rate of 600 billions of cubic feet per year. This is greatly in excess of your own pro-

duction which was 403,500 millions of cubic feet in 1939, the latest year that was influenced little by war conditions.

Many people believe that today's economic conditions are abnormal. A reaction from present business levels is quite likely. Certainly no one would contend that the trend of natural gas requirements since 1939 could be projected into the future indefinitely. It seems probable that your natural gas companies will have ample gas—ample to meet increased local needs as well as the requirements of new areas they propose to serve. It may even be that you have over-bought. Perhaps you will be unable to use all the gas brought to you unless you look to economically inferior uses.

If we look at the history of natural gas pipelines, we find that the long lines have sometimes furnished more gas than distributors need under normal conditions. There have been cases when the pipeline company and, in turn, the distribution company are committed to buy more gas than they can sell for superior uses. Like all enterprises that require large capital, both pipeline companies and distribution companies have financial obligations that must be met. Under these conditions, short-sighted companies begin to raid other markets. The pipeline company sells gas to a large industrial consumer, usually on an interruptible basis, at a price that the distribution company cannot meet. The distribution company must then, in turn, sell dump gas. And a foolish and uneconomic condition is developed. We do not plan to be caught in this fix, nor to have our expansion place our customers in such a fix. We hope to extend to new markets that have large potential requirements—new markets that can be developed to complement the markets we now serve.

Balanced Fuel Economy

This balanced fuel economy that you have reached does not prevail over the entire nation. It does not prevail in any area where people must be ever conscious of the cost of each gallon of hot water—if they have hot water—or must be ever conscious of the cost of turning on the kitchen stove. An area, or a community, does not have a balanced fuel economy if dependable, automatic heating is beyond the reach of people who are willing to pay for home conveniences but who cannot afford gas heat if its relative cost makes it a luxury. A balanced fuel economy does not prevail where skilled craftsmen are trying to meet today's exacting industrial specifications with an unsuitable fuel.

Some areas, of course, can never have a balanced fuel economy. They are too remote from adequate coal supplies, from the centers of oil production or refining and from natural gas fields. Fuel is so expensive in some areas, for example, that coal is shipped in sealed box cars. So vital is fuel and energy of all kinds to the needs of our modern civilization, however, that those areas where fuels are scarce are sparsely settled except where some special local resource is being exploited.

Our industrial areas, however, must have a balanced fuel economy. They must have abundant supplies of fuel and energy in the forms best suited to their needs, just as they must have tools and machinery and adequate transportation. Each of us is dependent on these integrated industrial communities for a part of the things that make up our standards of living. We are dependent on Akron and Detroit, on Minneapolis and Kansas City, on Lowell and Schenectady. We are dependent on these cities for the things they produce and they are dependent on our home communities for the goods and

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services that our customers furnish them. Anything that helps one of these communities to produce better products or less expensive ones, helps each of us and our home towns.

In other words, if one important section of our country does not prosper fully it will not be long before you and I feel it in our pocket-books. And Tennessee Gas, having made provision to deliver to the Appalachian region annually almost as much gas as you produced and sold in 1939, feels that it must seek the right to extend its transmission lines to New England.

In our estimation, this eastern project meets all the tests of public convenience and necessity. It will make available to the populous communities in these areas a means of achieving a balanced fuel economy. It will open up a market in which our natural gas resources will be used for superior purposes. A new tool wil be made available to the people of New England and their use of it will benefit all of us.

New York and New England

All of you are familiar with eastern New York state and New England. Our studies of those areas show that their natural gas requirements will never approach those of the Appalachian area. However, there is no doubt that the gas sold there will be used for superior purposes. To some extent natural gas will replace other fuels, but largely it will be a new fuel, distributed by gas companies now established, and adding to the comfort and convenience of the millions of people to whom it will be available. In the East, natural gas will be more expensive than it is here, as all fuels are, but it will be a most important addition to the fuel resources of those areas.

While the Appalachian and the Northeastern areas are both important centers of industry, there are marked differences in the type of industrial fuel requirements. This area is characterized by steel mills; that area by non-ferrous metal plants. Here are plants that need millions of cubic feet of natural gas every day for production operations; there the factory operations are largely mechanical and natural gas will be needed in lesser quantities for precision heat treating and finishing processes. Here is concentrated heavy industry, largely devoted to making capital goods; there they have many finishing plants, devoted to making consumers goods.

At present there are some odd characteristics of the requirements of Eastern gas companies. A number of New England companies have their maximum day's sendout in summer. Many customers, we are told, use gas for heating in the spring and fall, but change to coal or oil in the severe part of the winter. Very common is the practice of heating water with furnace coils in winter. Because of the price of fuel in the Northeast, it is used much more sparingly than is customary in places where it is more abundant. New England, today is handicapped by a lack of natural gas. It must have gas if it continues to compete with other industrial regions.

By extending long lines to these new markets a pattern of development established here in the Appalachian area is being re-created on a national scale. The same public benefits will result. The producers, the gas companies, and the consumers will each profit because of the enlarged volume. And, it is easy to see how the producer will benefit from this expanded market. Soon his gas will become so valuable that he cannot afford to waste it in a flare. Already these flares have greatly diminished in Texas and I hope that the day will come soon when they will vanish altogether.

Conclusion

I hope I have made one point of this talk clear. I think it could be summed up in this sentence: "If we in the fuel industry do not make the best possible use of the resources we have, someone else will." At the risk of being trite I would like to remind you that we in America often don't realize our advantages. And often we don't realize the responsibility that goes with these advantages. The United States is the only nation in the world today where petroleum resources are owned by individuals rather than the government. We all know that there are thousands of people in this nation who keep very busy trying to find flaws in our democratic system. For these people the closets of the public service corporations are a favorite hunting ground for skeletons, and the so-called monopolies are the first to go under when a dissatisfied populace takes over. Even in England, our late great ally, public utilities as we know them have ceased to exist, and their employees are now working for the government.

It is up to you and me, if we preserve our jobs and our heritage, to do a better job of utilizing our nation's resources, better than the totalitarians can ever hope to do.

We must stretch the life of our resources over the longest possible period, both by elimination of waste and by proper usage. We must make them available to all the people. In short, we must operate our business in the public interest. That is, in the public interest of all the people, and thereby achieve a balanced fuel economy.

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Removal of Excess Nitrogen from Natural Gas

PRACTICAL and economical methods of removing excess nitrogen to improve the heating qualities of natural gas and permit the recovery of other salable hydrocarbon products were discussed during a recent two-day conference in Amarillo, Texas, of nearly 100 leading gas engineers and executives of operating and research departments of major gas pipe line and related companies.

Sponsored jointly by the U. S. Bureau of Mines and the American Gas Association in connection with their cooperative study of nitrogen-removal problems, the conference, emphasized several benefits of removing excess nitrogen from natural gas at its source in the field. Aside from the improved heating quality of the natural gas, the removal of nitrogen would increase the capacity of long cross-country pipe lines in terms of measured heating units of fuel, eliminate the non-combustible element in natural gas, and allow the extraction of such heavy hydrocarbons as propane and butane, which are desired for separate sale.

Work on the nitrogen-removal problem is being conducted by the Bureau of Mines at its Amarillo Helium Plant with P. V. Mullins, helium engineer, in direct charge of the problem under the supervision of C. W. Seibel, supervising engineer, Bureau of Mines helium plants, at Amarillo, and R. A. Cattell, chief of the Petroleum and Natural Gas Branch, Bureau of Mines, Washington, D. C. The Natural Gas Department of the American Gas Association, of which George H. Smith is director, is cooperating through its Technical and Research Committee, H. D. Hancock, chairman, and a special subcommittee under the chairmanship of A. F. Bridge, Southern Counties Gas Company, Los Angeles, California.

Prospective Processes

At the Amarillo meeting, Bureau engineers presented data on developments to date in their study of the subject, and led discussions of technical and economic phases of the problem. As part of the program, engineering contractors presented information on prospective nitrogen removal processes. Irving Resnick, chief process engineer of the Stacey-Dresser Company, Cleveland, Ohio, and W. W. Bodle, assistant manager of the Chemical Division, J. F. Pritchard and Company, Kansas City, Mo., presented information on prospective means for nitrogen removal by low-temperature processes. Howard Kehde, process engineer of the Foster-Wheeler Corporation, New York, presented information on gas separation and prospective nitrogen removal by the hypersorption process, a new method now being applied industrially for large-scale separation of gaseous mixtures by fractionation on activated charcoal in a continuous process. All three speakers presented estimates of investment and operating costs for projected nitrogen removal plants based on information presently available. Particular stress was placed on economic benefits to be gained by increased recovery of propane, butane, and heavier hydrocarbons.

Effect on L.P. Extraction

The presence of 10 percent or more of nitrogen detracts appreciably from the heating value of the natural gas per unit volume, may limit or prohibit the extraction of heavy hydrocarbons such as propane and butane, and reduces the capacity of long cross-country pipe lines in transportation of a maximum of fuel as measured in heating units. Nitrogen in natural gas corresponds to noncombustibles, or ash, in coal. Nitrogen removal from the gas at its source in the field would save expense in handling and transmission, besides overcoming other objectionable features.

Transmission Economies

Natural gas from certain large reserves—notably those in the Texas Panhandle and Hugoton (Kansas) fields—contains an average of 10-15 percent of nitrogen, with as much as 30 percent in gas from some parts of the fields. These sources supply natural gas transported through a number of the most important cross country pipe lines and, therefore, the principal interest in nitrogen removal centers in these reserves. It is estimated that about $500,000,000 is invested in facilities to transport gas from these fields and, assuming an average of 12 percent nitrogen, about $60,000,000 of this amount and a like proportion of operating and distribution costs are devoted to handling the inert gas, nitrogen. It is estimated that about 4,000 tons of nitrogen per day are transported over an average distance of 800 miles.

At the Amarillo meeting, particular emphasis was given to possible means for removal of nitrogen by low-temperature processing — liquefaction and fractionation—which is similar to the method used by the Bureau of Mines in extracting helium from natural gas. The Bureau has recently installed an experimental nitrogen removal pilot unit at its Exell Helium Plant, near Amarillo, to investigate this method under the cooperative study. The pilot unit and plant were visited during an inspection tour by those attending the Amarillo meeting.

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Recent Court Decisions
Affecting Gas Utilities

Validity of Gas Tax Laws

By
Leo T. Parker
Attorney at Law
Cincinnati, Ohio

ANY GAS CORPORATION official who *knows* the law may definitely decide whether a law is valid which licenses or taxes gas companies. The purpose of this article is to clearly explain the new law laid down by recent higher courts so that readers may know whether a gas tax is valid or void.

It is true, of course, that a majority of tax state laws and city ordinances are valid and enforceable. Conversely many higher court decisions are on record declaring license and similar taxation laws void.

First, it is important to know that *all* license taxation laws are void which are unreasonable, discriminatory, or arbitrary. Also, no municipality has *natural* rights to assess a license or tax on gas companies.

Thus city ordinances are void which are prohibited by a Federal or state law, or contradictory to the United States or State Constitution. Moreover, a city ordinance is invalid which taxes gas companies if the collection of the same taxes is collectable by the state, or if the ordinance conflicts with a state law.

However, under the municipal "police power," granted by laws of all states, all things which are injurious or detrimental to the public may be suppressed, policed, regulated or prohibited. Hence valid license fees or taxes may be assessed to *defray* municipal expenses in enforcement, inspection and other necessary actions. On the other hand, the amount of tax as a police measure may not be out of proportion to what is reasonable in relation to the expense of the city to police or regulate the taxed business. The latest higher court decision involving these points of law is Alabama Gas Company v. City of Montgomery, 30 So. (2d) 651, reported September, 1947. The facts of this case are: Since 1942, the Alabama Gas Company has furnished natural gas for heating, lighting and power to consumers within a city and also to number of consumers *outside* the corporate limits, but within the police jurisdiction of the city. One branch of the gas company's business consists of selling gas appliances and fixtures, operating a retail store for that purpose. The gas company installs pipes and appliances in the customers' houses and charges the customers as any other plumbing concern or gas fitter charges.

The gas company maintains an office in the city, and the locale of its management is that office. Bills for gas furnished are sent out monthly from that office.

An ordinance was enacted by the city which specified a license tax on the gas company for business "carried on in the city of Montgomery." Schedule is as follows: "Gas companies, furnishing manufactured or natural gas for heating, lighting and power, on gross business of $125,000.00 and less, $2,500.00, and in addition thereto two percent on gross business in excess of $125,000.00."

Another ordinance was passed which prescribed a license for engaging in business "outside the corporate limits of the City of Montgomery, but within the police jurisdiction thereof," in an amount equal to one-half the license tax for engaging in such business within the corporate limits of the city.

The gas company has paid all license taxes claimed by the city for gas furnished for heating, lighting and power purposes to consumers within the corporate limits of the city, but it refused to pay the license tax for gas furnished for heating, lighting and power purposes to consumers without the corporate limits of the city.

It is interesting to observe that the higher court held that the gas company need not pay taxes specified by both ordinances, and said:

"It may be that an electric utility has some tendency toward a need for police supervision, though the agreed facts show that it has never called into use such power in respect to this situation. If the 2 per cent charge in a city has any relation whatever to police supervision, it cannot with any reasonable analysis be said to be responsible for half of the charge. But if it were, then there would be as much charge for supervision without as within the city, which is contrary to the spirit of the authority conferred, since the amount of the charge for police supervision is effected by the populousness of the community."

Therefore, this court held that the ordinance was void primarily because the city attempted to tax the gas company the same amount for police supervision outside the city as it was taxed for police supervision within the city. The fact that the expense of police supervision outside the city was considerably less than the police supervision within the city resulted in the tax law being invalid.

For comparison, see Standard Chemical & Oil Company v. Troy, 77 So. 383, L.R.A. 1918C. This court held that a municipality can levy a license tax under its "police power" on a manufacturing plant located beyond the territorial limits of the city, but within its police jurisdiction.

And in Alabama Power Company v. City of Carbon Hill, 175 So. 289, it was said:

"We declare the true rule to be that, as an exercise of police power merely, the amount exacted for a license, though designed for regulation and not for revenue, is not to be confined to the expense of issuing it; but that a reasonable compensation may be charged for the additional expense of municipal supervision over the particular business or vocation, at the place where it is licensed. For other cases which hold likewise see Ash v. People, 11 Mich. 347; Carter v. Dow, 16 Wis. 298; Tenney v. Lenz, 16 Wis. 566."

Hence, it is quite apparent that when a city fixes the amount of a license charge or tax for business conducted within its limits, it may include an amount for revenue and an additional sum for police regulation. Also, this same rule of law is applicable to a company located in a city, and which does business outside the city limits. If police, fire, sanitary or other regulations are needed to safeguard the health, morals or safety of citizens either in the city or outside its city limits, it may tax the local business and also the business transacted outside the city, but always in proportion to the expense of supervision. If the expense of supervision outside the city is less, then the tax must be proportionally less.

For example, in McLendon v. Kerr, 97 So. 145, the court said:

"If the city is dealing with a business which is reasonably classed as inherently or potentially injurious to the sanitation, health, peace, and comfort of the inhabitants or conditions in it, and imposes a license charge for doing business in the city, primarily predicated on the ground that it is a police measure it may not be improper to fix as a charge on such a business in the police jurisdiction an amount reasonably proportionate to the charge on such a business in the city."

When Not To Pay

Considerable discussion has arisen from time to time over the legal question: When may a gas company refuse to pay a license fee?

First, it is important to know that illegal license fees paid voluntarily can be recovered from a municipality, but illegal *taxes* paid *voluntarily cannot* be recovered from either a state or city.

For instance, in the leading case of City of Charlottesville v. Marks' Shows, Inc., 18 S. E. (2d) 890, it was shown that a corporation after a protest paid a city a license tax of $454.50. Later it sued the city to recover this amount, and proved that the tax law is void.

The higher court decided that the city had collected *taxes* and not license fees. Therefore, it refused to order the city to refund the money and said:

"The right to recover taxes which have been illegally levied and collected has its limitations. In an unbroken line of decisions this court has held that in the absence of statute taxes illegally assessed and paid voluntarily and not under compulsion cannot be recovered in an action of law."

Thus, although a state tax law or city ordinance is invalid, the gas company cannot recover *taxes* voluntarily paid. The reason for this law is that every man is supposed to know the law, and if he voluntarily pays a tax which the law would not compel him to make he cannot afterwards assign his ignorance of the law as a reason why the state or city should refund the money.

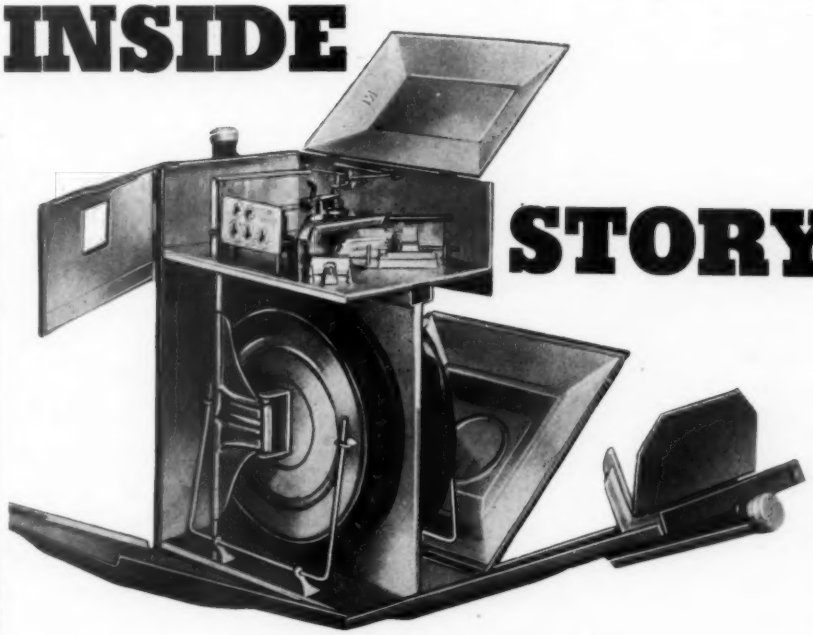
Also, see Town of Phoebus v. Manhattan, 105 Va. at page 149, 52 S. E. at page 840, 8 Ann. Cas. 667. This court said:

"All payments are presumed to be voluntary until the contrary is made to appear. . . . The mere declaration of the plaintiff (gas corporation) when it made payment, that it was made under 'protest,' does not show that it was not voluntarily made."

In this case at the time the payment was made the corporation's agent declared to the tax recorder that the payment was being made "under protest," and the officer so noted on his records. Nevertheless, it was held that the tax could not be recovered.

On the other hand, all courts are in accord with the proposition that gas corporations may sue and recover from a state or city *license fees* illegally collected.

INSIDE STORY



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In order that readers may be able to distinguish purely license fees from taxes it is well to explain that where the fee is imposed for the purpose of *regulation,* such sum is a license. But if the money is exacted solely for revenue purposes, and without police protection, it is a tax.

Thus, if a gas corporation pays illegal *license* fees it may sue and recover the money paid. But if the money paid is classified as illegal taxes, it cannot sue and recover this money.

Sales Tax Valid

Modern higher courts consistently hold that a reasonable tax on retail sales of gas, and other commodities sold by utilities, is valid notwithstanding contention that such a tax law violates Federal and State Constitutions.

For example, in Tampa Gas Company v. City of Tampa, 31 So. (2d) 468, reported October, 1947, it was shown that a state law in Florida was passed which authorized cities and towns to impose a tax of not more than 10% on income from utilities which sell electricity, metered gas, water service, telephone service and telegraph service.

Pursuant to this law the city adopted an ordinance whereby it levied a tax on the amount received for utility services.

A suit was filed by the Tampa Gas Company, and other utilities, contending that the ordinance is void because it violates the Constitution of the United States; and the Constitution of Florida.

The higher court refused to agree and, in holding the ordinance valid, said:

"We may say here that it is clearly apparent that there is no merit in the contention that there is any violation of the State or Federal Constitution."

For comparison, see Commissioner of Corporations & Taxation v. City of Springfield, 71 N. E. (2d) 593, reported June, 1947, it was shown that a state law provides that a portion of the corporate franchise tax paid by gas, electric light, gas and electric light and water companies on account of stock owned by nonresidents corporations shall be paid to the town where the company conducts its business. The higher court upheld the validity of this law, saying:

"It must be observed that the present system of distribution of the proceeds of corporate franchise taxes paid by gas, electric light and water companies, is upon the basis of the situs of the corporation so far as the distribution between cities and towns is concerned."

Butane Not a Liquid

Butane was discovered by chemists in about 1910. However, it was a waste product at the oil wells until the middle 1920s, when an economical and convenient method was devised for the capture of the gas and its compression. Then the oil companies commenced to ship butane in small containers to individual customers. The first community distributing system was constructed in a small Indiana town in the year 1928. Since then the industry has greatly and rapidly expanded with consequence that state laws have been passed to tax the sale of this commodity. However, according to a recent higher court butane is not taxable as a "volatile substance," and as a liquid.

For illustration, in Tennessee Gas Company v. McCanless, 199 S. W. (2d) 108, reported June, 1947, it was shown that a state law was litigated which imposes a tax by the gallon on gasoline and other "volatile substances." It was contended by state authorities that this state law gave them power to collect taxes on butane. The higher court refused to agree and said:

"To justify an inference that the Legislature intended to tax a substance in a state of temporary artificial liquefaction, some expression of such intent would have ot be made in the statute itself."

Unreasonable Taxation Laws

Generally speaking, a city ordinance is invalid and unenforceable which imposes an "unreasonable" tax, although power is delegated to the municipality by state laws to enact taxation laws. In other words, a municipality always is limited by the constitution to impose license laws that are reasonable, non-discriminatory and not prohibitive. Moreover, a taxation ordinance is invalid where it is shown that the sole purpose of the law is to eliminate "outside" competition. This is so because laws of this nature are discriminatory.

For instance, in Hines, 164 Pac. 339, a city ordinance was adjudicated which provided that corporations located within the city shall pay a license fee of only 10% paid by corporations situated *outside* of the limits of the city. The higher court held this ordinance void, saying:

"We are of the opinion that the provisions of the ordinance attempt to create and enforce a discrimination not based upon differences in the nature of the business being transacted or differences in the manner of conducting the same business."

Also, in Campbell Company v. City Maryville, 31 F. (2d) 466, a city ordinance of the same kind was held void. This court stated the following important law:

"A city, having the power to impose license taxes undoubtedly may classify them, *if the classification has some reasonable basis.* . . . Where it appears that the real intent and purpose is, not to raise revenue, but to destroy the business of nonresidents, then nonresidents are denied that equal protection of the laws which the Constitution guarantees to all."

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Engineered to produce MORE HEAT.. FASTER..AT LESS EXPENSE

The new Humphrey 120-A Model Gas Unit Heater is designed to "fit the plans" — in heat output, ease of installation, economy of operation, saving of floor space and cleanliness. It incorporates all the soundly engineered time-tested principles that have always characterized Humphrey products — plus startling innovations and improvements resulting in a definite step forward in forced air gas heating.

Check these features against your customers' specifications:

SUPER COMBUSTION BURNER

- Exclusive "dual flame" stainless steel burner tips.
- Precision built for high efficiency and long, trouble-free operation.
- Compact — Easily adjusted.
- Quickly removed for inspection.

MORE HEAT OUTPUT

- Large surface of the exclusive Humphrey "Free Flow" heat exchanger effects rapid transfer of heat to air stream.
- No baffles — no cleaning problems.
- Streamlining offers little resistance to air flow through heater.

ATTRACTIVE DESIGN

- Beautiful modern lines.
- Designed to blend with any surroundings.
- Rich ivory finish — Dust resisting.

INCREASED ECONOMY

- Costs less to install. Gas and electrical connections easily made.
- No expensive steam piping or furnace room. No wasted fuel during slack periods.
- No wasted space.
- Reduces cleaning bills.

Write today for complete literature on the Humphrey 120-A Model Gas Unit Heater.

GENERAL GAS LIGHT COMPANY

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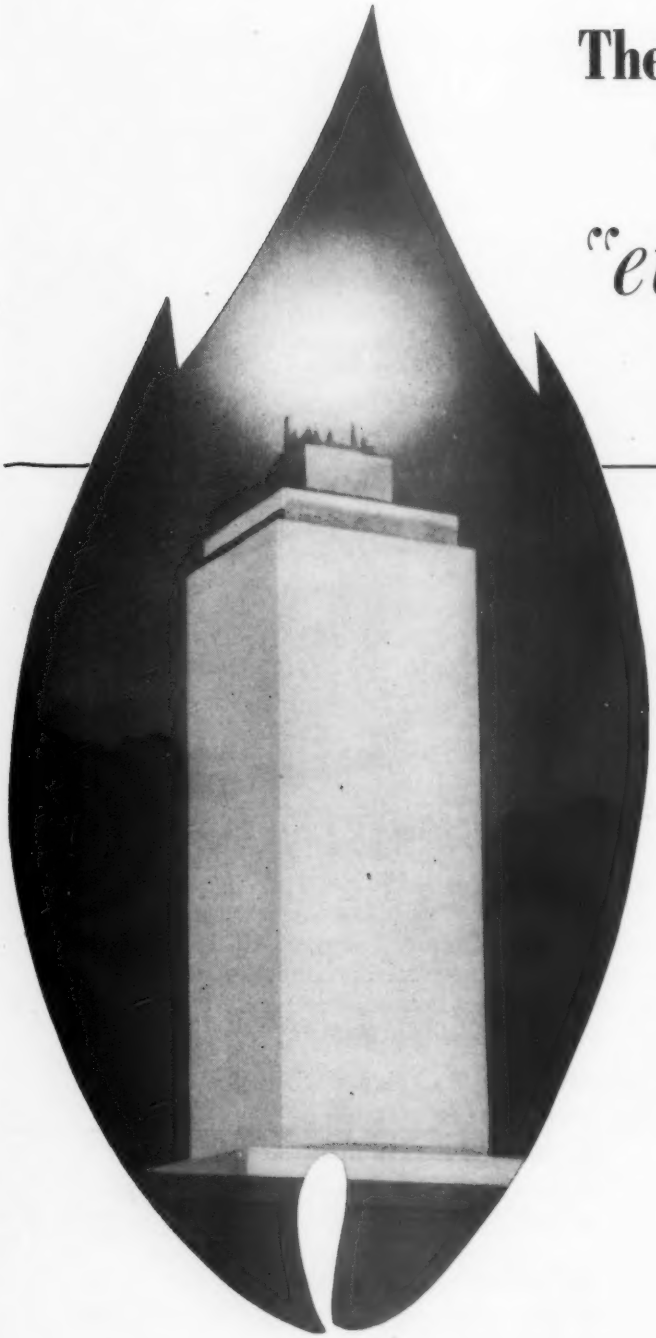
To All Delegates and Visitors To The A.G.A. Convention and The G.A.M.A. Exhibition



The Columbia Gas System

Cordially Invites You To See

"eternal flame"

The Story of Natural Gas

Filmed In Gorgeous Color With Sound, Music, Dialog

This film, produced under Columbia's sponsorship, is believed to be the first to tell a comprehensive story of the natural gas industry. It is told in terms of people—gas people and their customers—capturing some of the drama of this public service.

See it at the first Natural Gas Department, A.G.A., session or in Room B, G.A.M.A. Exhibition Hall, Atlantic City, October 4 to 8.

Watch For An Important Announcement At The Convention

COLUMBIA GAS SYSTEM

The Manufacturers Light and Heat Company
Atlantic Seaboard Corporation
Amere Gas Utilities Company
Virginia Gas Distribution Corporation
Virginia Gas Transmission Corporation
Big Marsh Oil Company
The Ohio Fuel Gas Company
Central Kentucky Natural Gas Company
Binghamton Gas Works
Cumberland and Allegheny Gas Company
Eastern Pipe Line Company
Gettysburg Gas Corporation
Virginian Gasoline and Oil Company
United Fuel Gas Company
Home Gas Company
The Keystone Gas Company, Inc.
The Preston Oil Company
Natural Gas Company of West Virginia
Union Gasoline and Oil Corporation

Along the Pipe Lines

F. P. C. Reports Facilities Authorized During First Six Months of Year. Will Add Over 800 Million Cubic Feet of Capacity to Individual Natural Gas Systems.

FACILITIES designed to add over 800 million cubic feet of daily delivery capacity to individual natural gas systems in the United States and involving more than 3,500 miles of new pipeline were authorized by the Federal Power Commission during the six months between January 1 and June 30, 1948, Acting Chairman Harrington Wimberly announced recently.

For the large projects costing $700,000 or more, the estimated cost of the authorized additions was approximately $233,215,252. These major projects are expected to benefit 70 cities of 50,000 or more population in 12 states and the District of Columbia as well as numerous smaller communities. The construction would add at least 878,500,000 cubic feet daily to the capacity of the systems involved.

The largest single authorization during the semi-annual period was for construction by Trans-Continental Gas Pipe Line Company, Inc., of a line from Texas to New York City to supply new markets in the Middle Atlantic area. This project, which includes 1840 miles of pipeline and 15 compressor stations with units aggregating 160,000 horsepower, is designed to deliver 340,000,000 cubic feet of gas daily to utilities in New York, Pennsylvania and New Jersey.

The major projects covered by the certificates of public convenience and necessity issued during the six-month period, involved construction of approximately 3,574 miles of new gas pipelines and installation of compressor units aggregating 229,575 horsepower.

Comparable figures on an annual basis indicate that during the fiscal year ending June 30, 1948, certificates were issued by the Commission covering a total of 8,468 miles of pipeline and installation of compressor units aggregating 531,455 horsepower. Total estimated cost for the year was $519,945,633.

In this connection, Acting Chairman Wimberly said:

"Some indication of the widespread trend toward increased use of natural gas during the last few years may be gained from the figures compiled recently by the staff. Since the Commission was first given the function in 1942 of issuing certificates of public convenience and necessity to natural gas companies, a total of 20,456 miles of pipeline and 1,254,739 horsepower of compressor capacity have been authorized. Thus the pipeline mileage and compressor capacity authorized during the last year represent well over a third of the total authorized to date.

"The natural gas industry is making a strong effort to supply the demands of consumers. Shortage of steel for pipe and other essential equipment is delaying construction of the facilities planned and authorized."

Cities of 50,000 population or more which will benefit as a result of certificates issued during the six-month period include:

Alabama—Birmingham and Montgomery.

District of Columbia—Washington.

Georgia—Atlanta, Columbus and Macon.

Illinois—Decatur, Peoria, Springfield, Chicago, Cicero, Evanston and Oak Park.

Indiana—Fort Wayne, Muncie, Evansville, East Chicago, Hammond, Gary and South Bend.

Kentucky—Covington, Lexington and Louisville.

Michigan—Flint, Jackson, Kalamazoo, Lansing, Pontiac, Saginaw, and Grand Rapids.

New Jersey—Elizabeth, Bayonne, Camden, East Orange, Hoboken, Jersey City, Newark, Passaic, Patterson, Trenton and Union City.

New York—New York City (all boroughs), Binghamton, Syracuse, Rochester and Buffalo.

Ohio—Akron, Canton, Cleveland, Cleveland Heights, Lakewood, Youngstown, Columbus, Springfield, Dayton, Toledo, Cincinnati and Hamilton.

Pennsylvania — Chester, Pittsburgh, Erie, Altoona, Johnstown and McKeesport.

Tennessee — Chattanooga, Knoxville and Nashville.

West Virginia — Wheeling, Charleston and Huntington.

G.A.M.A. Issues Complete Study of Authorized Pipe Lines

The Gas Appliance Manufacturers Association, 60 East 42 St., New York, recently issued a study on natural gas supply and pipe line construction, completed, authorized and pending, covering period from July 1, 1945 to May 15th, 1948.

It shows that the Federal Power Commission has authorized in that period, natural gas pipelines of a total mileage of 32,738, with an estimated tonnage of 7,585,300. These figures include the Transcontinental Gas Pipe Line Co. which was authorized the latter part of May.

This project constitutes the largest and most costly natural gas project ever to come before the Commission. It involves expenditures totaling more than $150,000,000 and the laying of 1,839 miles of line, requiring approximately 498,200 tons of line pipe. Most of the gas will be sold to utility companies as a substitute for fuel oil and other fuels in the production of manufactured gas.

The gas utilities to be served include the Consolidated Edison Company of New York, The Brooklyn Union Gas Company, Public Service Electric and Gas Company, Long Island Lighting System, Kings County Lighting Company, Brooklyn Borough Gas Company, New York and Richmond Gas Company, Elizabethtown Consolidated Gas Company, and the Philadelphia Electric Company.

The GAMA study lists all companies that have received F.P.C. authorization, giving number of miles, sizes of pipe in inches, number of compressors installed, cost of project, communities to be benefited and the daily MCF increase in capacity. A copy of the study can be had by addressing the Association.

Memphis to Get Gas Supply from Texas Gas Transmission

Texas Gas Transmission Corporation has announced that it has started construction of a natural gas storage reservoir for the

City of Memphis.

The storage facilities will consist of 63 miles of 26-inch pipe line, extending from Lula, Miss., to Memphis. Its capacity will be 67 million cubic feet of gas, the Company said. At its northern end the pipe line will tie into the City of Memphis gas distribution system so that gas may be delivered from storage during peak cold weather periods this winter.

Contracts for construction of the pipe line have been let to two Texas firms. The N. A. Saigh Company, San Antonio, will lay the southern half of the line; the Horrigan Construction Company of Houston will build the northern section. Pipe and equipment for the project are now distributed along the right-of-way, and construction was scheduled to begin about September 15. In addition to laying the pipe line Texas Gas stated it would make changes in its Lula compressor station to permit filling the reservoir during warm periods.

The Company received an emergency certificate from the Federal Power Commission on August 26 authorizing the construction.

Texas Gas also has before the FPC an application to construct an 840-mile, 26-inch pipe line from Texas to Ohio to enlarge its existing system. On approval of this application, the 63-mile pipe line will form an integral part of the new pipe line.

Ohio Fuel Gas Company Adds New Compressor Station for Underground Storage

A new compressor station of The Ohio Fuel Gas Company began operations recently. This project is a part of the company's program to make available sufficient supplies of gas in the territory they serve. This was revealed in an announcement from the Chemical Plants Division of Blaw-Knox Company.

Known as the Weaver Compressor Station and located near Perrysville, Ohio, the new station is a large repressuring unit for the underground storage of gas. It has been equipped initially with five large compressor units with a total capacity of 6,350 h.p. The installation has been designed for a pressure of 1,200 p.s.i.

Full completion of Weaver Station is expected in October. Meanwhile, in preparation for the expected heavy demands for gas this coming winter, two of the compressor units started pumping gas into underground storage September 1st.

Manufacturers Lt. & Heat Co. Appoints Kuzmich

Paul N. Kuzmich has joined the gas engineering department of The Manufacturers Light and Heat Co. and will specialize in corrosion protection of pipe lines.

Mr. Kuzmich has his headquarters in Pittsburgh. He will eventually work on pipe line corrosion problems throughout the five-state area which is supplied natural gas by The Manufacturers Light and Heat Co. and associated gas companies in the Pittsburgh Group of The Columbia Gas System, Inc.

New Jersey Gas Assn. Holds One Day Annual Meeting

THE New Jersey Gas Assn., held its thirty-third annual meeting Sept. 10th at the Monmouth Hotel, Spring Lake, N. J.

Howard H. Melvin, Vice President of the Association, in the absence of H. A. Sutton, President, reviewed the activities of the Association for the past year, and was followed by Ira L. Craig, Philadelphia Electric Co., who presented an analysis of the gas business, particularly manufactured gas, for 1948.

He reviewed the increasing costs of supplies and labor and the reason why increased rates were necessary so that the industry could increase production, keep up its services to its customers, and remain in a good financial condition.

Roy Alderman, Vice President, McCann-Erickson, Inc., New York, made suggestions as to the kind of copy to be employed in utility advertising to best accomplish the objective.

"LP Gas from the Ground Up," was the subject of a paper by William H. Kramer, District Manager, Phillips Petroleum Co., New York. His paper appears in this issue of the Journal.

R. J. Rutherford, Vice President, Worcester Gas Light Co., Worcester, Mass., and who also is Chairman of the Domestic Gas Research Committee of A.G.A., reviewed the work of his committee in a paper titled "Domestic Gas Utilization Progress Through Research."

The officers elected for 1948-1949 were: H. H. Melvin, Millville, N. J., President; L. W. Becker, Jr., Elizabest, N. J., First Vice President; R. H. Phillips, Jr., Newark, N. J., Second Vice President, and E. A. Smith, Newark, N. J., Secretary-Treasurer.

Industrial Dust and Fume Control

Effective industrial dust and fume control by means of exhaust systems depends upon confining or housing the source of dust or fume production as completely as possible and establishing a proper air movement through such exhaust hoods, enclosures, or housings to the exhaust piping system. This principle is being stressed in the work of the Sectional Committee on Safety Code for Exhaust Systems, Z9, representative of 24 national governmental, technical and trade organizations, which is now working on the development of a Safety Code for Exhaust Systems.

At a recent meeting of the Committee, working under the procedure of the American Standards Association, it was agreed and strongly advocated that manufacturers of equipment, machinery, and apparatus which in operation produces dust or fumes should provide housings or enclosures as an integral part of the original design. There is little more reason for such equipment being furnished without provisions for effective dust and fume control than there is for furnishing such equipment with unguarded gears, in the opinion of the committee. The manufacturer has intimate knowledge of the operating action of his equipment, the air currents which it may create, and the access points needed for inspection, adjustments, and maintenance. As a result, by cooperating with dust and fume control engineers he can provide effective workmanlike enclosures or housings with provision for proper exhaust system connections as an integral part of the machines. While this practice may result in some increase in the purchase price of the equipment, insofar as overall cost to the ultimate user is concerned it would prove more economical in the long run. This is due to the fact that some means of controlling fumes and dust must be provided locally after installation if they are not furnished with the equipment. Such locally added exhaust hoods, enclosures, housings, etc., are a compromise, at best, as they frequently are improperly designed and fabricated and the control results are poor.

Standard Pipeprotection Inc. Organized at St. Louis, Mo.

A 20-acre site at 3000 S. Brentwood Blvd., Brentwood, St. Louis, Mo., has been acqiured by Standard Pipeprotection Inc. for the operation of a plant for coating and wrapping small diameter steel pipe, the plant to be in operation by January, 1949.

President of the company is George B. McComb, Summit, N. J. Hugh W. Baird, Evanston, Ill., is vice president.

Both Mr. McComb and Mr. Baird formerly were associated with the Barrett Division of Allied Chemical and Dye Corp., New York, Mr. McComb as general sales manager, and Mr. Baird as regional district manager in Chicago. John B. Wilson of Tenafly, N. J., former executive assistant to Mr. McComb at Allied Chemical, will be secretary-treasurer of the new company Mr. McComb said.

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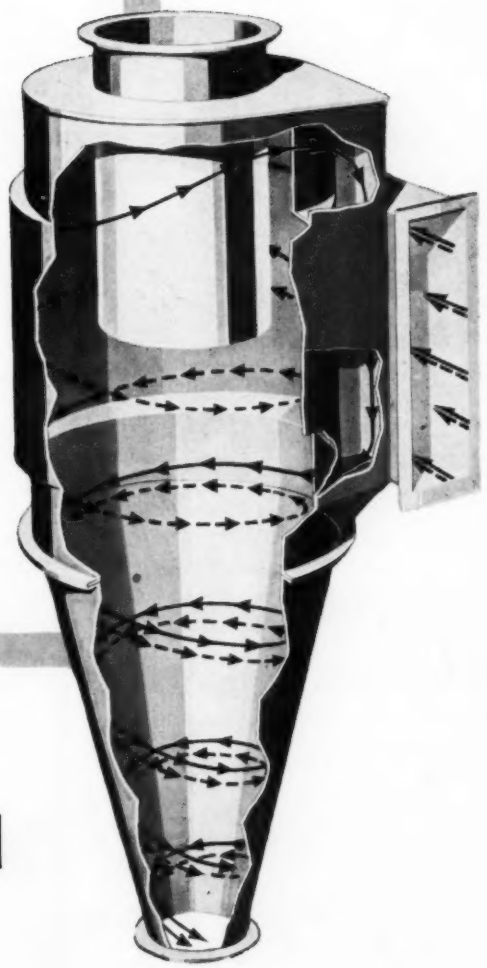
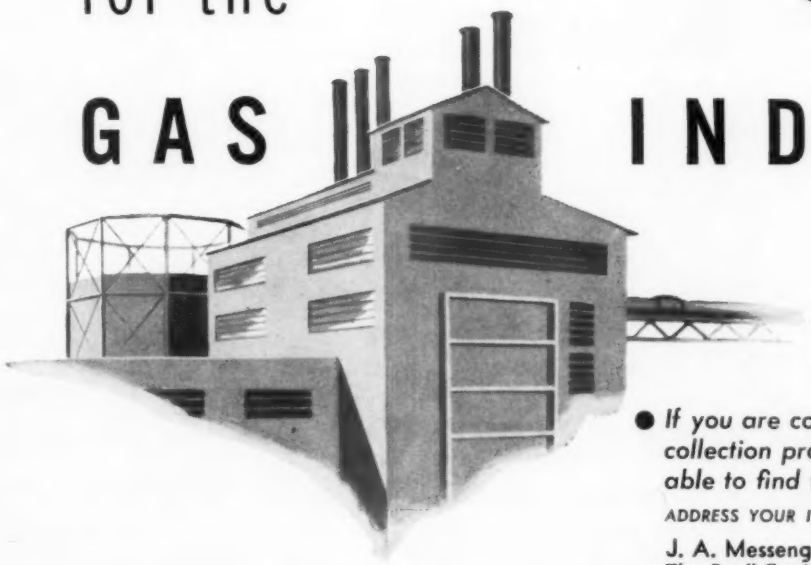
VAN TONGEREN
CYCLONE

COLLECTORS



. . . specially designed
for the

GAS INDUSTRY



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ADDRESS YOUR INQUIRY TO:

J. A. Messenger, Vice President
The Buell Engineering Company
20 Cedar St., Suite 5000
New York 5, N. Y.

New Equipment and Appliances

Combustion Test Set

F. W. Dwyer Manufacturing Co., Chicago, announces a new combustion test set, to tell whether a heating installation — gas, oil, or stoker — is correctly functioning.

Dwyer Test Set

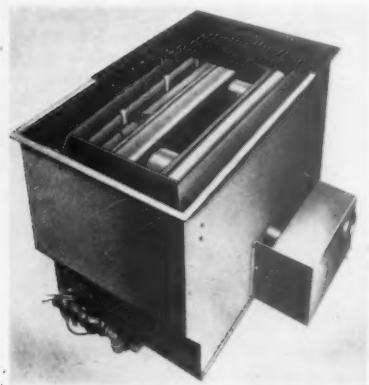
Designed for checking CO_2 and draft, as well as locating air leaks and adjusting air controls. Basically, the set includes a new style CO_2 indicator, a small precision draft gauge and a pencil type stack thermometer, which with the accessories permits every necessary test to be made.

Copies of bulletin No. 220 and other information may be obtained from the manufacturer, 317 South Western Avenue, Chicago 12, Ill.

Gas Floor Furnace

Temco's new shallow gas floor furnace measures only 25½" over all depth.

The unit is equipped with a Porcelain Enamel heat chamber



Temco Floor Furnace

which is guaranteed not to rust, corrode or burn out.

The new model provides a recessed, easily accessible, compact control assembly to simplify installation and maintenance.

A ceramic port burner is incorporated to further improve the efficiency and lasting quality of the unit.

Standard equipment on all models includes 100% safety Pilots. Automatic electric temperature controls are optional but, when specified by purchaser, are installed at factory.

These new gas floor furnaces include 35,000, 50,000 and 70,000 Btu models. Made by Tennessee Enamel Mfg. Co., Nashville 9, Tenn.

New Divided Top Range

Caloric Stove Corporation, 1242 Widener Bldg., Philadelphia, Pa. has introduced a four-burner divided top Ultramatic Caloric gas range built on a 36" Chassis.

New Caloric Model

Demands in certain localities where space considerations are a factor, prompted the management's decision to offer this companion model to their present 40" divided top range.

The new model, 6628, will include all the features of the Ultramatic Caloric line and are available, as is the entire line, in CP or not as desired.

Dealer mats and catalog pages are now available.

Heat Panel

A fully vented wall panel gas fired heat circulator, designed to fit between the standard 16" spacing of 2" x 4" studs. Heat is delivered to the room by convection and radiation from an air tight steel heating element. A small mesh metal outlet grille makes accidental contact with the heating element impossible. A double blanket of air insulates the heating element from the cabinet keeping the cabinet safely cool.

The Heat Panel is equipped with a 100% safety pilot which stops all gas flow in case of accidental flame extinction. Control may be either manual or thermostatic.

Capacity—25,000 Btu/hr. input, AGA approved for natural, manufactured, mixed or liquified petroleum gas.

Manufactured to Lennox specifications by Modern Metal Products Company for The Lennox Furnace Company, Marshalltown, Iowa.

New Oven Clock Control

International Register Company announces production of a new clock control for gas ranges. Known as the RT-10021, this model will be available for operation with normally open, normally closed electric gas valves, or with special combination mechanical-electric gas valves. A double throw switch can be provided where required on special application, to control the range appliance receptacle.

Gas Range Control

Basically, the RT-10021 combines the same motor, switch, and mechanism as in the current RT-6000 series. However, a rearrangement of the parts makes possible a smaller unit, and the round escutcheon as shown in the illustration.

For complete information write to: International Register Company, 2614 West Washington Boulevard, Chicago 12, Illinois.

there's something about a flame!

IT BOILS BEST
IT BAKES BEST
IT ROASTS BEST

AND IT BROILS LIKE CHARCOAL

smart cooks know

GAS has got it

AND Universal PROVES IT

Gas has captured the hot flame of glowing coals, separated it from its hot bed and applied it, clean and modern, to cooking. Universal gas ranges completely control this natural heat. In boiling, Universal top burners give not three speeds, but four set speeds, plus any more you want. In baking, Universal is famous for uniformity . . . tests show practically no variation in temperature from one corner of the oven to the other. Universal gas ovens keep juices inside the roast and do it while the housewife is downtown . . . on-off by automatic clock control.

Yes, there's something about a flame, and when it comes to broiling, Universal's Radiant Mesh broiler restores the hotbed and puts in charcoal's double punch—*flame* and *glow*. Only Universal brings to the home this feature, so long used in better hotels and restaurants.

Smart cooks appreciate comfort and safety, too. "Comfort-Touch" has added air cooling to the surface of the range, so that oven and broiler doors may be touched at any time with perfect comfort and safety. No range—with or without the precious flame—can claim as much.

PROVE "COMFORT-TOUCH" TO YOUR CUSTOMERS BY INSTALLING A "COMFORT-TOUCH RANGE" AND RUNNING THE OVEN ALL DAY LONG!

Guaranteed by Good Housekeeping

CRIBBEN & SEXTON Universal TRADEMARK REG. GAS RANGE

Only Universal offers "Comfort-Touch"

CRIBBEN & SEXTON CO. 700 NORTH SACRAMENTO BOULEVARD • CHICAGO 12, ILLINOIS

Human Hands... However Skilled

cannot make diaphragms as precise as VULCANS!

In the realm of art, skilled hands still excel. But in making a gas meter diaphragm, science and up-to-date machinery leave hand shaping, fluting and stitching far behind.

VULCAN Diaphragms are *molded* to the exact shape desired, dimensionally accurate. This is a great advancement over hand shaping, bulky crimping and stretching of leather to get the proper fit. This positive molding, together with a controlled uniformity of thickness, results in a uniform product with no spot or area subject to undue bending or wear.

Use VULCAN Diaphragms for greater accuracy in metering. They are superior in *shape,* superior in *material.*

VULCAN RUBBER PRODUCTS MADE BY VULCAN PROOFING CO. BROOKLYN N.Y.
"THE MARK OF QUALITY"

Vulcan
PROOFING COMPANY
FIRST AVENUE & 58th STREET • BROOKLYN 20, NEW YORK

A Computer for Supercompressibility Factors

By

F. C. Walters,

Superintendent Transmission Gas Measurement,
Panhandle Eastern Pipe Line Company

PANHANDLE Eastern Pipe Line Company has developed a circular computer (Fig. 1) for the direct reading of supercompressibility factors for natural gas. The computer will indicate with one setting the value of supercompressibility factors to the fourth place past the decimal for both displacement meter and orifice meter measurements. The first computer has been in use in Panhandle Eastern's Gas Measurement Office since early April of this year. The computer has been found to facilitate meter chart calculation procedure since it eliminates the necessity of reading supercompressibility factors from curves or tables. It has also been found to be readily adaptable to clerical interpretation.

Diameter of the Computer is 14 inches and is adaptable to clerical operation. Wooden base 15 inches square supports the turntable on which computer is mounted.

The computer is composed of three polished aluminum plates on which the scales are etched. The outer plate is an annular ring containing the pressure scales and is permanently fixed to a turntable so that the "read" pressure may be brought to proper eye level to facilitate reading. The inner plate, containing the super-compressibility factors is circular and is also fixed to the turntable except that its position with respect to the pressure scales may be varied in order to calibrate the computer against periodic determinations. After calibrating, it can be fixed in position with the use of set screws provided on its underside. The top plate, containing the index and temperature scales, is a circular segment and rotates on its center. A tilted wooden base, 15" x 15", supports the turntable on which is mounted the computer. The diameter of the computer is 14". The combined weight of the instrument is six pounds.

The computer is based on an empirical equation which is generally accepted in the standard practice of natural gas companies. The development and application of the equation is set forth in the California Natural Gasoline Association Bulletin No. TS-354, dated 1936, and entitled "Tentative Standards for the Determination of Superexpansibility Factors in High Pressure Gas Measurements." The equation may be expressed as follows:

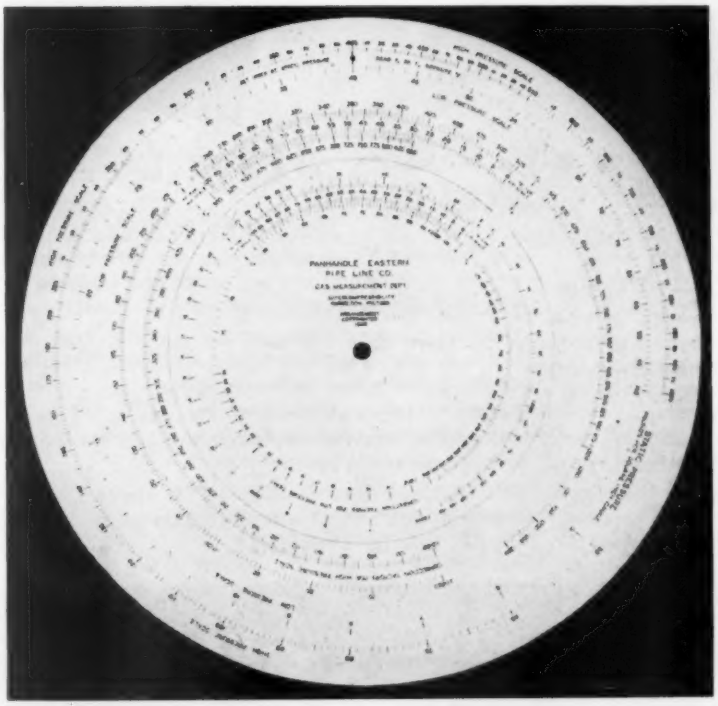
$$N = \frac{KP}{T^{3.825}}$$

where

N = Deviation from Boyle's Law —a decimal
K = A constant
P = Static Pressure—pounds per square inch gauge
T = Absolute temperature—°F.

In principle, the computer is a circular slide rule from which may be read directly the supercompressibility factors to be used in displacement and orifice meter calculations. Since the supercompressibility factor varies with the pressure and temperature of a gas, the pressure, temperature, and supercompressibility factor scales are incorporated on the computer.

To facilitate accurate reading, the computer incorporates two pressure scales, the low pressure scale ranging from 5 to 100 psig and high pressure scale ranging from 50 to 1000 psig. The temperature scales range from 0° F. to 100° F. The supercompres-



The inner plate which carries super-compressibility factors is fixed to the table and its position may be varied in making determinations. The top plate, shown here, contains the index and temperature scales.

sibility factor for displacement meters is denoted as F_d and for orifice meters as F_o. To avoid crowding the notation on the supercompressibility factor scales, the scale notation is limited to the last significant figures of four places past the decimal point, except where the number of the significant figures changes from one to two, two to three, etc. At these points the entire factor is shown in slanted figures.

Since the value of the constant "K" in the above equation varies with the composition of the gas, the computer can be calibrated by setting known temperature and pressure conditions against the value of the supercompressibility factor determined at those conditions and by locking in place (in the proper position) the circular section of the computer on which is shown the correction factors.

Example of Calibration

From a test, the deviation from Boyle's Law is 0.0672 at a pressure of 400 psig and a gas temperature of 60° F. Since F_d is equal to $(1 + N)$, its value is equal to 1.0672 at the above temperature and pressure conditions. Therefore, to calibrate the computer, the index is set at 400 psi on the high pressure scale and the segment on which is shown the supercompressibility factor scales is rotated so that the value 1.0672 (F_d) on the scale marked "Correction Factors for High Pressure Scale" is in line with 60 on the scale marked "°F. for H.P. Scale." The segment on which is shown the supercompressibility factor scales is then locked in position by means of set screws. The temperature scale then becomes the only moving part of the computer.

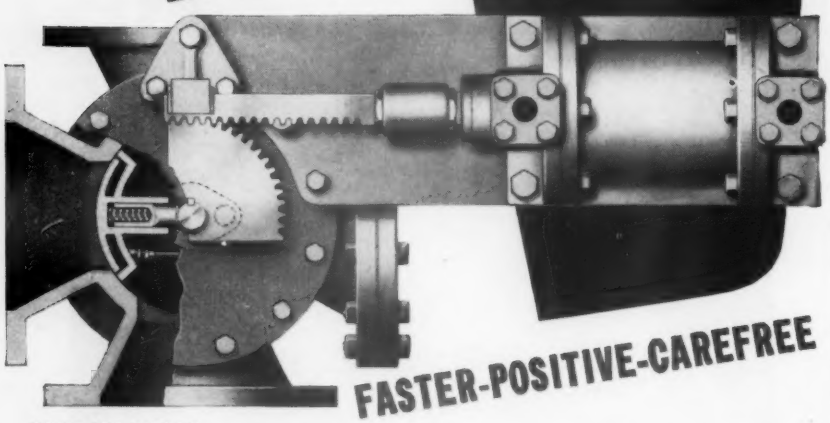
Following a calibration of the computer, it is then necessary only to set the index at the required gas pressure and to read the supercompressibility factor F_d or F_o opposite the applicable gas temperature on the proper scale.

The calibration of a computer will depend upon the frequency of supercompressibility tests or determinations. Some companies use average values as long as such values remain within a set tolerance. Others carry out periodic tests or determinations and apply such results during interim periods. Upon consideration of general operating practices, it is evident that calibration of the computer in most instances will be fairly infrequent. Where factors must be applied in routine operations to gases of different characteristics, the recalibration of one computed for each group of meter charts would be feasible if not required too frequently. The computer has been arranged so that calibration is a simple and fast operation taking only a few minutes to perform. In some instances, however, it might be desirable to calibrate and assign an individual computer for the handling of each group of charts.

The computer has been copyrighted by Panhandle Eastern Pipe Line Company and arrangements are being made for its manufacture.

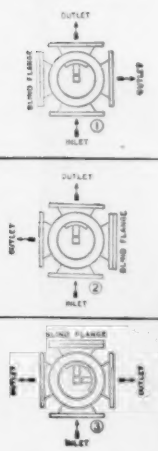
NATIONAL REVERSE VALVES

SPEED-UP THE OPERATING CYCLE For REFORMING NATURAL GAS



FASTER-POSITIVE-CAREFREE

INLET AND OUTLET ARRANGEMENTS OF REVERSE VALVE



This National Valve will reverse the flow of natural gas to be reformed in your water gas machine allowing one valve to do the work of three.

The cast iron body has generous venturi-type ports which assure unrestricted flow. Compact, flexible design permits installation in tight places.

Rack and segment stroke to the lubricated shoe is actuated by hydraulic cylinder and cuts valving time to a fraction of a second.

This National Valve is designed for use in Gas, Steam or Air Service with pipe lines of 6", 8", 10", and 12" diameter.

THE E. H. WACHS COMPANY

Engineers and Machinery Manufacturers Since 1883

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Posey Iron Works Inc.

Operating for many years as builders of steel tanks, stacks and general steel plate construction, the Lancaster Iron Works of Lancaster, Pa., has changed its corporate name to Posey Iron Works Inc. in honor of the founder and president of the organization, W. W. Posey.

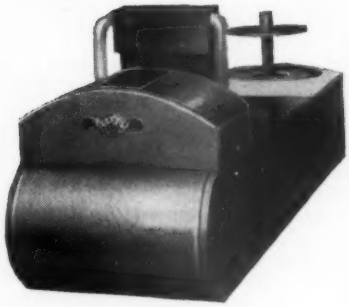
The same personnel and management will continue as heretofore including the respective divisions of the company.

A district office is maintained at 420 Lexington Ave., New York 17.

See the

GORDON

DUAL FUEL Conversion BURNER



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. . . and the distinguished Standard Line of Gordon Conversion Burners and Furnaces.

SERIES 400 SERIES 84 SERIES 302-20

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137 Arthur Street • Buffalo 7, N. Y.

"The Gem of Them All"

COLUMBIA CONVERSION GAS BURNERS

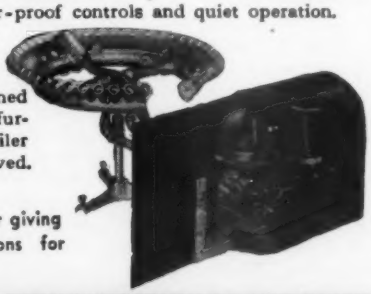
More Popular Than Ever

With Home Owners and Dealers

DEALERS SAY—Columbia Nutipe Burner has a common sense design. Closely duplicates operation of appliance when solid fuel was used. Easy to install. Seldom requires service.

HOME OWNERS SAY—Gives quick heat transfer and earlier delivery of heat to rooms. Has tamper-proof controls and quiet operation.

MODEL P-ZE shown here is designed for use in warm air furnaces or round type boiler where grates are removed.



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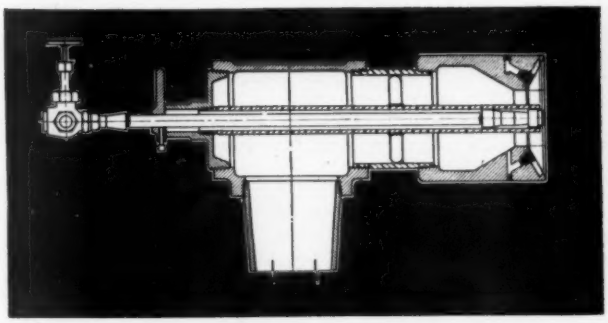

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News of the Gas Industry

Corrosion in the Forefront of Technical Study

An exceptional growth of a non-profit technical association to meet a specialized need is that of the National Association of Corrosion Engineers (NACE). Started in 1944 by only a dozen pipe line engineers who sought to do something about the enormous loss industry is suffering through corrosion, the Association in 4½ years has grown to include more than 1400 active members and 190 company members.

The active members, include principally engineers working on corrosion problems employed by companies in 32 industries, by various Federal, State and municipal agencies, and by the military services, universities and engineering consultants.

The company members include corporations in 18 industries. The managements of these corporations are recognizing that the economic losses of corrosion include not only the immediate plant repairs or renewals but also corrosion-caused production or service interruptions, commodity losses or spoilage, curtailed revenues, accidents, fires, personal injuries or deaths, public property damage, customer and public inconvenience, and employee, customer and public ill-will.

For dealing with soil corrosion, which directly and indirectly is costing industry about a billion dollars each year, NACE sparks the Correlating Committee on Cathodic Protection which is sponsored officially by it and Association of American Railroads, American Gas Association, American Petroleum Institute, American Public Works Association, American Water Works Association, Edison Electric Institute, International Municipal Signal Association, Inc., United States Independent Telephone Association, Bell Telephone System and Western Union Telegraph Co. This group seeks through education of managers and engineers to reduce corrosion of buried metal structures including 988,000 miles of oil, gas and water pipe, 167,000 miles of metal-sheathed communications and power cable and 425,000 miles of rail track much of which is protected by signal systems.

NACE sends monthly to each member a copy of its journal, *Corrosion*, in which is printed important technical articles dealing with corrosion problems of a wide diversity of industry. *Corrosion* also contains many abstracts of other current articles and news on corrosion subjects.

NACE is governed by officers and directors—who serve without pay—elected by the members, and by a small paid office staff headquartered at 905 Southern Standard Bldg., Houston 2, Texas, under A. B. Campbell, executive secretary.

Outstanding Program Arranged for Third Annual Personnel Conference of A.G.A.

An exceptional program directed to the interest of executives responsible for industrial relations and personnel policies of the gas utility industry will be presented at the Third Annual Personnel Conference of the American Gas Association at the Palmer House, Chicago, on November 18 and 19, 1948. The Conference is jointly sponsored by the Personnel Committee, A.G.A.; the Southwest Personnel Conference; the Midwest Personnel Conference; and the Great Lakes Personnel Conference. Speakers of national repute, both from within and without the gas industry, are scheduled to present in specific terms, the present day aspects of industrial and personnel relations.

L. A. Brandt, Director of Employee Relations, The Peoples Gas Light and Coke Company, Chicago, will preside at the morning session on Thursday, November 18. R. J. Rutherford, Vice President, Worcester Gas Light Company, will be the first speaker, and he will discuss the Management Hiring, Training and Promotion Plan of his company.

The Application of Industrial Engineering Techniques to Collective Bargaining will be presented at this session by William Gomberg, Management Engineering Department, International Ladies' Garment Union.

Charles G. Simpson, Jr., Industrial Relations Director, The Philadelphia Gas Works Company, will preside at the Luncheon Meeting on Thursday. He has, as his guest speaker, James F. Oates, Jr., Chairman, Peoples Gas Light & Coke Company.

The afternoon session on Thursday will be under the leadership of Willard G. Wiegel, Personnel Director, Lone Star Gas Company, Dallas. The opening talk "Friendship in Business" by W. H. Senyard, Director of Personnel, Louisiana Power & Light Company, New Orleans, will be a report on results of a survey on employee attitude his company recently made, as translated into employee training.

Donald S. Bittinger, Personnel Director, Washington (D. C.) Gas Light Company, and V. H. Luneborg, Personnel Manager, Arkansas Natural Gas Corporation, Shreveport, have made separate studies of the rate and costs of absenteeism and other "fringe benefit" costs. Results of these investigations will be reported in a discussion on "What Price Employee Relations" by both these executives.

Vernon Myers, Assistant to President, Sioux City Gas & Electric Company, will preside at the morning session on Friday, November 19. "Comprehensive Health Services" is the title tentatively selected by Dr. Howard Lindberg, Medical Director, The Peoples Gas Light & Coke Co., Chicago, for the opening discussion on Friday morning.

Pension plans are of vital interest to all gas industry companies. Roland S. Child, Associate Manager, Employee Relations, Central Hudson Gas & Electric Corporation, will ably discuss "What the Personnel Executive Should Know About Pensions," from a background of twenty-five years as student and practitioner of retirement systems.

Regional conference group luncheons and meetings will follow the adjournment of the Friday morning session. The Southwest Personnel Conference Group, the Midwest Personnel Conference Group and the Great Lakes Personnel Conference Group, will hold concurrent luncheons, at which mutual problems will be discussed. Conferees who are not affiliated with any of the three groups will be assigned to the luncheon meeting of their choice.

Energy for America

Last year, for the first time, petroleum and natural gas equaled coal as a supplier of energy consumed in the United States.

A comparison between 1915 and 1947 on the three major sources of energy is shown in the following table:

	1915	1947
Coal	86%	48%
Petroleum and Natural Gas	12	48
Water Power	2	4
Total	100%	100%

These percentages reveal the great changes that have occurred in the proportions during the last 32 years.—*The Lamp.*

Ruud Mfg. Co. Announces Personnel Changes

Lew E. Spear of Kalamazoo, Michigan, has announced his retirement after 42 continuous years in the gas appliance business, first with the General Gas Light Company, later with the Ruud Manufacturing Company. He installed the first inverted gas arc lamp in the old Fulton Market in New York City; also installed the gas lighting system in the old Madison Square Garden for the 1906 convention of the National Commercial Gas Association, predecessor of the American Gas Association.

J. R. Lavelle has been made manager of the New York City Direct-Factory Branch. New headquarters have been set up at the Harborside Terminal, Jersey City, N. J., and will serve Greater New York, Northern New Jersey, several counties in Southern New York and several in Southwestern Connecticut. The new branch will be fully equipped—warehouse, offices, service department and a full staff of salesmen to cover the area.

Mr. Lavelle has served as a member of the American Gas Association water heating committee for eight years and recently concluded a term of service as chairman of the water heater division of the Gas Appliance Manufacturers Association.

N.E.G.A. Fourth Annual Home Service Development Conference

The relationship between home economics education and utility home service work will be explored by 2 gas company sales managers covering 8 different points and by 2 home economics educators who will cover 8 additional points at the Fourth Annual Home Service Development Conference of The New England Gas Association at the Hotel Statler, Boston, on October 22.

The theme of the all-day Conference is "Utility Home Service Possibilities As Viewed By Educators—Management—Directors—Manufacturers." The Conference will be held from 9 a.m. until 5 p.m., with luncheon at 12:30 p.m. in the Salle Moderne.

The Conference will also present a symposium wherein 5 different gas company home service directors who have outstanding school activities will discuss the subject of "Utility Programs for High Schools."

A third symposium will be entitled "Our Most Outstanding Home Service Activity" and will be presented by 5 different gas company home service directors.

President Twohey of the NEGA will speak on "Home Service As I See It" and William J. Foster, vice president of the George D. Roper Corporation, will speak on "Appliance Selling By Home Service."

The program has been prepared by a committee with the following members: Ella A. Heyne, home service director, Northampton Gas Light Company, and vice chairman of the NEGA Home Service Group (Chairman); H. Dorothy Keller, home service director, Woonsocket Division, Blackstone Valley Gas and Electric Company, and secretary-treasurer of the NEGA Home Service Group (Secretary); and the following gas company home service directors: Gladys V. Bramblett of Fall River, Gertrude M. Crosthwait of Waterbury, Thelma Hunter of New Bedford, Susan A. Mack of Boston, Florence E. McKane of Portland, Miriam G. Reynolds of New Haven, and Ruth U. Weld of Lynn. Miss Margot J. Whitmire, home service director, Springfield Gas Light Company, and chairman of the NEGA Home Service Group, has cooperated with the committee—as have the officers of the Sales Division, of which the Group is a part. Miss Heyne will preside at the morning session and Miss Whitmire at the afternoon session.

Air Conditioning Exposition

The 9th International Heating & Ventilating Exposition will be held at the International Amphitheater in Chicago next January 24-28, with a display that will be the largest of its kind ever held.

The exposition is sponsored by the American Society of Heating and Ventilating Engineers in conjunction with its 55th annual meeting.

The exposition is under the management of the International Exposition Company with permanent headquarters at Grand Central Palace, New York. Charles F. Roth is manager.

CONVENTION CALENDAR

October

4–8 *American Gas Assn.* Annual Convention and GAMA Exhibit, Atlantic City, N. J.

14–15 *Texas Mid-Continent Oil and Gas Assn.*, Annual Meeting, Fort Worth.

21 *New England Gas Assn.* Operating Division. Hotel Sheraton, Worcester, Mass.

18–22 *National Safety Congress and Exposition*, Public Utilities Section, Stevens Hotel, Chicago.

22–23 *Southern California Meter Assn. Measurement & Control Instrument Exposition.* Municipal Auditorium, Long Beach, Calif.

25–29 *National Metal Exposition and Congress*, Philadelphia, Pa.

26 *Independent Natural Gas Assn.*, Tulsa, Okla., Mayo Hotel.

November

1–3 *Wisconsin Utilities Association*, Pfister Hotel, Milwaukee.

8–11 *American Petroleum Institute*, Stevens Hotel, Chicago.

8–12 *National Hotel Exposition*, Grand Central Palace, New York.

11–12 *Mid-Southeastern Gas Assn.*, Annual Meeting, Sir Walter Hotel, Raleigh, N. C.

18–19 *National Personnel Conference of the Gas Industry*, Palmer House, Chicago.

28 to Dec 3 *American Society Mechanical Engineers*, Hotels Pennsylvania and New Yorker, New York.
National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York.

January

10–11 *A. G. A. Accounting Section*, Hotel Cleveland, Cleveland, O.

24–27 *A. G. A. Home Service Workshop*, Hotel Statler, Cleveland, O.

March

7–10 *National Assn. of Corrosion Engineers Annual Convention*, Cincinnati, Ohio.

17–18 *Oklahoma Utilities Assn. Annual Meeting*, Tulsa Hotel, Tulsa, Okla.

24–25 *New England Gas Assn.*, Hotel Statler, Boston.

April

4–6 *Distribution, Motor Vehicle & Corrosion Conference*, Netherlands Plaza Hotel, Cincinnati.

6–8 *AGA Sales Conference on Industrial & Commercial Gas.*

11–13 *AGA-EEI Spring Accounting Conference*, Hotel Book-Cadillac, Detroit, Mich.

11–13 *Mid-West Gas Assn. Annual Convention*, Hotel Fort Des Moines, Des Moines, Iowa.

18–20 *Midwest Power Conference*, Hotel Sherman, Chicago, Ill.

20–22 *Southern Gas Assn. Annual Convention*, Buena Vista Hotel, Biloxi, Miss.

May

9–13 *AGA Industrial Gas School*, Hotel Severin, Indianapolis, Ind.

12–14 *Southwestern Gas Measurement Short Course*, University of Oklahoma, Norman, Okla.

23–25 *AGA Production & Chemical Conference*, Hotel New Yorker, New York, N. Y.

24–27 *National Restaurant Exposition*, Atlantic City, N. J.

25–27 *Gas Appliance Manufacturers Assn. Annual Meeting*, Drake Hotel, Chicago.

26–27 *The Natural Gas & Petroleum Assn. of Canada Annual Meeting*, Hotel London, London, Ont.

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For Purifying Manufactured Gas.

Reports of analyses by different chemists show that this iron material has excellent ability to pick up traces of sulphur and completely remove the latter from foul gas at a rate many times superior than normally required in commercial purifiers. Also recommended to prepare Sponge boxes.

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National Radiator Co. Elects Baumgardner, V. P.

The National Radiator Company, Johnstown, Pennsylvania, announces the election of Carroll M. Baumgardner as Vice President for Sales, succeeding Mr. John C. Barnes, who resigned.

C. M. Baumgardner

Mr. Baumgardner recently resigned as executive vice president and director of United States Radiator Corporation, Detroit, Michigan, and also as president and director of Capital Finance Corporation, Detroit.

Mr. Baumgardner is chairman of the executive committee of the Institute of Boiler & Radiator Manufacturers and a Director of Plumbing and Heating Industries Bureau, Chicago, Illinois.

New Manual on How to Select Industrial Processing Ovens

A new "planning guide for production people concerned with heating, heat treating, baking or curing problems"—purported to be the first manual of its type ever offered to oven users—has just been announced by Gehnrich & Gehnrich, Inc., under the title of "How To Select the Right Oven For Your Process."

The manual discusses: the four basically different types of oven heating systems; when to use which; the different heating media; temperature and safety control; insulation; the material-handling problem; interesting ingenuities; the action of different products under heat (chemically, physically, metallurgically, structurally); and the seven basic oven and heater types.

Liberally illustrated, the 32-page, two-color book includes: 43 drawings and diagrams, 23 photographs, 7 oven-selection tables, and numerous important definitions and listings.

The first 18 pages undertake to give the reader a basic understanding of oven application principles in organized, easy-to-read sections. The latter part of the work describes the basic oven and heater types, gives selection information and shows how special adaptations are made for special jobs.

Semet-Solvay Appoints Kring Chief Engineer

William D. Kring has been appointed Chief Engineer of Semet-Solvay Division, Allied Chemical & Dye Corporation, 40 Rector Street, New York, N. Y. He has been associated with the Division and its predecessors for many years. Mr. Kring succeeds Julius Becker, who has served the Division and its predecessors continuously for 36 years. Mr. Becker died on August 25th.

A. O. Smith Corporation Absorbs Burkay Co.

The A. O. Smith Corporation announced recently that it has taken over the assets of the Burkay Company of Toledo, Ohio, a company that manufactures large volume water heaters, high efficiency home heating boilers and gas conversion burners.

For several years the A. O. Smith sales organization has marketed the Burkay volume water heater under the trade name "Smithway-Burkay." The present move means that A. O. Smith is taking over all products of Burkay, and is thus acquiring items closely related to the domestic automatic water heaters that A. O. Smith makes in its plant at Kankakee, Illinois.

The Burkay assets include the trademarks, various patents, inventories of parts and finished goods, equipment and good will. The Milwaukee company is also taking over Westlake Products Company, an affiliate of Burkay located in Toledo.

Certain key personnel of the Burkay Company will join A. O. Smith. They include Adolph Burklin, who was vice president in charge of engineering; Henry Orr, vice president and general manager; and M. B. Mackay, field service manager.

J. W. Long

The new operation will be under the direction of J. W. Long, manager of the Special Products Division of A. O. Smith. The Division will continue to manufacture two types of the large volume water heaters. It will also make two sizes of heating boilers, one of 100,000 b.t.u. input for average homes of five to six rooms, the other of 190,000 b.t.u. input for homes of seven to twelve rooms and for commercial and industrial applications. Manufacture of the Smithway-Burkay gas conversion burners also will be continued.

Bryant Heater Company Appoints New Advertising Manager

In line with a progressive and expanding advertising program, Bryant Heater Company of Cleveland, Ohio, has named Howard A. Kennedy as advertising manager for consumer products. He succeeds Mr. Fred O. Habegger, who recently became Sales Manager of Bryant-Williams Company, Pittsburgh, Pa.

Howard A. Kennedy

Kennedy has had long and varied experience in advertising. He was formerly an associate account executive with Fuller & Smith & Ross.

In his new capacity as advertising manager, Kennedy will co-ordinate the various advertising efforts of Bryant Heater Company. Working with the market research and sales promotion departments, together with Bryant's advertising agency (Fuller & Smith & Ross), Kennedy's department will plan an over-all program of advertising in line with Bryant's new sales strategy.

Koppers Chemical Section of Engg. and Constr. Div.

The Engineering & Construction Division of Koppers Company, Inc., has set up a new Chemical Section to supervise and co-ordinate engineering and construction work on contracts secured for the erection of plants to produce oxygen, synthetic fuels, and certain types of chemicals, as announced by Joseph Becker, Vice President.

Heading up the new section will be T. M. Osborne, who has been project manager on Koppers' contract to build a $4,500,000 synthetic liquid fuels plant for the government at Louisiana, Mo.

The new section will have general responsibility for all contracts to build oxygen plants and synthetic liquid fuels plants, as well as for contracts for chemical plants which are not directly associated with coke oven and steel plants. In addition to the plant being built at Louisiana, Mo., the Koppers Engineering & Construction Division has virtually completed a tonnage oxygen plant at Johnstown, Pa.

Research Engineer Appointed by Sprague Meter Company

Charles W. Stewart has been named Research Engineer for The Sprague Meter Company, Bridgeport, Conn. Prior to his appointment he was associated with the San Diego Gas & Electric Company, San

Charles W. Stewart

Diego, Cal., for twenty-seven years, during which time he specialized in gas measurement, distribution and utilization problems. In his new position he will coordinate research and production to fit the future trends in the changing conditions anticipated in measurement, utilization and pressure control of Natural, Mixed and Manufactured gases.

Rockwell Appoints Dixon Divisional Vice-President

W. F. Rockwell, Jr., President of Rockwell Manufacturing Company, announced the appointment of L. A. Dixon to the vice-presidency of the Company's meter and valve divisions.

Mr. Dixon is well known in the utility, petroleum and municipal markets, having done considerable field work in the promotion of the Company's products for the past twenty years.

L. A. Dixon

He was associated with the Wisconsin Axle Company and started at the Pittsburgh Equitable Meter Company, now a division of Rockwell Manufacturing Company, in 1926, as Assistant to the President.

Later, he was President of the Pittsburgh DuBois Company, manufacturers and distributors of gas meters. When that company was acquired by the Rockwell Manufacturing Company, he continued to serve in the same capacity until recently, when he relinquished that position to accept the new assignment.

E. E. Hedene

Rockwell Appoints New Chief Engineer

Rockwell Manufacturing Company announces the appointment of E. E. Hedene to Chief Engineer of all operations of the Nordstrom Valve Division. He was formerly the Chief Engineer of the Nordstrom Valve plant at Oakland, California, where for the major part of his twenty-two years service he worked directly with Sven Nordstrom, the inventor and developer of the Nordstrom lubricated plug valve.

Mr. Hedene will be headquartered at the Company's general office at Pittsburgh. His duties will include considerable field work in addition to coordinating the Nordstrom engineering activities at the Pittsburgh, Hopewell, Oakland and East Chicago plants.

Selecting Appliance Salesmen

A 24-page booklet, titled "The Home Appliance Market," has been issued by The Cleveland Heater Co., Cleveland, Ohio, as a guide for manufacturers and dealers in the selection of sales personnel.

Briefly it covers the essentials for successful salesmanship and is also a guide for a prospective salesman's self-analysis.

Can be furnished in quantity with manufacturer's or dealer's imprint at a nominal cost. Sample copy on request.

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"like a hot knife through Butter!"
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REAMER
THE LOW COST WAY TO INSTALL ANY PIPE
Even the toughest earth formations, like rotten rock, are no obstacle to Hydrauger operations. In fact, Hydrauger has fewer limitations, especially in time and costs, than trenching; and it is more certain than pipe-pushing, particularly if the pipe is coated, wrapped or of large size.
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EARTH BORING TOOL

Cribben & Sexton Elects Davis Pres. and Jalass V.P.

Wendell C. Davis has been elected President, and Harold E. Jalass Vice-President of Cribben & Sexton Co., Chicago, it was announced recently by George D. Wilkinson, Chairman of the Board of Directors. The company manufactures Universal Gas Ranges.

Mr. Davis joined the company as Controller in 1942. He was elected Treasurer in 1943, a member of the Board in 1946, Vice-President in 1947. He now succeeds W. M. Hillborn, who has resigned.

Wendell C. Davis Harold E. Jalass

During his association with the company, Mr. Davis has guided all financial matters, as well as handling all war contracts and aiding in the reconversion of plant and equipment to gas range production.

Mr. Jalass joined Cribben and Sexton Company in 1917 and became District Manager of metropolitan Chicago in 1931. He was appointed General Sales Manager of the Company in the latter part of 1946 and will continue in this capacity.

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Leak Proof:—

Gauge fluid is contained within the gauge. Just connect to the line and loosen the cap a half-turn. Made of aluminum, brass and unbreakable tubing. Will outlast several "U" gauges.

Low in cost—profitable to use.

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ALDUS C. HIGGINS

Aldus C. Higgins, 75, for nearly a half century closely identified with Norton Company, the largest industry in Worcester, Mass., and long active in the city's cultural, philanthropic and educational life, died September 10 at his home in Worcester, Mass.

At time of his death he was chairman of the Norton Company executive committee. His first Norton employment was as patent counsel, starting July 1, 1900. He had served in many Norton executive positions, including that of president, general manager and chairman of the board of directors.

From patent counsel with Norton Emery Wheel Company, Mr. Higgins progressed to counsel and resident manager of the abrasive plant in 1901.

In 1903 he was advanced to general counsel and general manager of the abrasive plants. He was named secretary and general counsel in 1913 and served in these offices until 1919. From 1919 to 1933 he was treasurer and general counsel and in 1933 succeeded the late Charles L. Allen as president, becoming both president and general manager.

He was elected chairman of the board of directors in 1941 and held this position until January, 1946, when he became chairman of the executive committee.

Gas Oven Thermostats

Bulletin 2732 issued by Penn Electric Switch Co., Goshen, Ind., describes a new line of gas oven thermostats in which the flexible diaphragm is actuated only by the liquid expansion caused by bulb temperature in the oven. There are two types—No. 50 for gas oven only and No. 75—a combination gas valve and oven thermostat. Bulletin sent on request.

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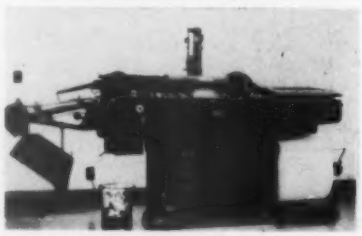
OFFICE EQUIPMENT
in excellent condition



Class 3700-E Electric Automatic Form Printing and Addressing Addressograph, complete with Counter, Quadruplicate Gearing, Reversing Stacker, Front and Back Printer, Outboard Bearing, Three Punches, Supply Cabinet, Paper Register and 110V AC motor.

Also available is approximately one ton of paper (nine rolls) which will make about 33,000 bills per roll. Paper is 20# Sulphite Bond and 16⅛" width.

Any reasonable offer considered.

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1 De Laval feedwater pump—serial 60134, 160 pounds steam, Speed 2370, Head 520' G.P.M. 300

1 Large Dean of Holyoke reciprocating feedwater pump—12" x 7" x 12" Serial D91243

1 Sturtevant turbine air blower used on boilers—Serial #125038, RPM 2030, H.P. 39, Type B-12, Pressure 160, Back pressure 5 pounds, Size 75

1 Terry steam turbine used on boilers—H.P. 20, steam pressure 125, RPM 2735

2 225 H.P. Babcock and Wilcox water tube boilers complete with stacks and four Peabody oil burners and two blowers for use in burning of oil

1 300 H.P. Babcock and Wilcox water tube boiler complete with two Peabody oil burners and one air blower for use with burning of oil

1 De Laval turbine—Steam end—#28272, Type 65TC, steam pressure 120 pounds RPM 4400, Gas End #28272, Discharge pressure 27" water column, 5,000 CFM, 16" pipe connections

2 De Laval steam turbines—Steam end—Serials #40599 and #40600. Steam pressure 110 pounds, Type 280TC, Speed 3600 RPM. Gas End—1—De Laval gas pusher #40599, Discharge pressure 5 pounds, Speed 3600, 10,000 CFM, 16" gas connections

1 Mixed gas exhauster—Connersville Type #5625, powered by Troy steam engine, Displacement per revolution 45 cu. ft., 20" inlet and 20" discharge connections

1 Connersville mixed gas exhauster #7398, powered by Troy steam engine, 26" connection inlet and discharge piping, displacement per revolution 57 cu. ft.

Address—Box #189, c/o American Gas Journal Inc., 53 Park Place, New York City 7.

FOR SALE

Miscellaneous Cast Iron Pipe

2 pcs. 16" C.I. Pipe S & S 12'-0" ea.	2450#
2 pcs. 16" C.I. Pipe S & S 6'-0" ea.	620#
1 pc. 16" C.I. Pipe F & F 20"	314#
1 pc. 24" C.I. Pipe F & F 30"	720#
1 pc. 36" C.I. Pipe S & S 62"	1780#
1 16" C.I. Shoe Ell F & H	674#

Price 10c per pound, f.o.b. Cincinnati, Ohio.
Stacey Brothers Gas Construction Co.
Cincinnati 16, Ohio.

Plant Supt. Wanted

Wanted experienced water gas plant superintendent to take charge of small plant located in Florida. Winter peak load 1,500,000 cubic feet. Plant capacity 2,500,000 cubic feet. Must be experienced, sober and capable. Good salary and living conditions. Reply Box No. 188, c/o American Gas Journal, 53 Park Place, New York 7, N. Y.

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Home Service Appointments

Irving K. Peck, vice president and general manager of the associated gas companies in the Pittsburgh Group of The Columbia Gas System, Inc., has announced the appointment of two new home service directors.

Miss Alice Leban has assumed responsibility for home service programs for The Manufacturers Light and Heat Co. in the northern portion of the gas company's distribution district No. 3. From headquarters in New Castle, Pa., she will conduct home service activities in Ellwood City, Emlenton, New Bethlehem, and Knox, Pa.

Miss Margaret Easley has been appointed home service director of Binghamton Gas Works, Binghamton, N. Y. She replaces Miss Helen F. Vernon, who recently resigned. From her headquarters in Binghamton, Miss Easley will conduct home service activities in such communities as Johnson City, Endicott, Watkins Glen, Hancock and Deposit.

The Reliable Shut-Off for Street Mains

THE GOODMAN STOPPER

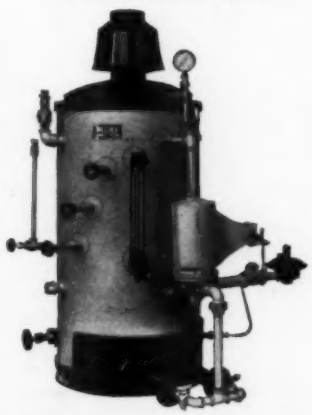
Now has the "Z" handle for easy manipulation. When locked in place it holds. Stopper cannot slip. Gas cannot pass. Adjusted in 30 seconds.

Ask for circulars on this and other distribution equipment.

Nearly a half century of service to the Gas Industry.

Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, New York

LATTNER GAS BOILERS
1 H.P. to 45 H.P.



2 H.P. Gas Fired Pressing machine boiler. 100 lbs. ASME Code.

P. M. LATTNER MFG. CO.
CEDAR RAPIDS, IOWA

A Gild Breakfast was held at Pacific Coast Gas Association meeting at Santa Cruz, September 15, 1948.

In the front row, left to right are Wayne Smith, Bert Sutton, Frank Packer, Carl Sorby, Tom Hall, Tom Arden, George Baldwin, Hal Singleton and Tommy Tomlinson.

In the back row are Stan Hobson, W. R. McLaughlin, Bill Hoyt, Bo' Boezinger, George Stevenson, Bill Bailey, Jr., Ernest Hawkinson, Seward Abbott, Howard Ferris, Leigh Whitelaw, Chet Lyford, Jim Donnelly, Jack Delaney and Ed Howard.

A Scroll was presented to Frank Packer for his interest and effort in behalf of the Gild.

P.S.C. Grants Higher Gas Rates in Westchester, N. Y.

A temporary increase in gas rates has been granted to Westchester Lighting Company by the New York Public Service Commission. This is the first increase in the company's gas rates since 1921.

It is estimated that the changes authorized by the Commission will increase the company's gross revenues by approximately $3,200,000 a year. Of this increase, approximately 40 per cent, or $1,280,000, will be paid directly to local, State and Federal governments in the form of increased taxes.

The Public Service Commission ordered retained the three different rate districts: Yonkers and Mount Vernon; New Rochelle and vicinity; and White Plains and the rest of Westchester County.

The result of the new interim gas rates is an increase of three cents a 100 cubic feet of gas in the cooking and water heating blocks, and of three-and-a-half cents a 100 cubic feet in the house heating block.

Considering the county as a whole, it is estimated that the overall increase will be 32 per cent. The 133,000 customers who use gas for cooking and water heating will pay an increase of 16½ per cent, and the 12,000 additional customers who use gas for all household purposes, including house heating, will pay an increase of approximately 55 per cent.

Copies of the new interim gas rates, effective from August 17, 1948, have been sent to customers. Bills of customers were pro-rated so that estimated use of service prior to August 17 was billed at the old rates and the remainder at the new rates. The new rates will be in effect until June 30, 1949, pending the conclusion of the rate proceedings.

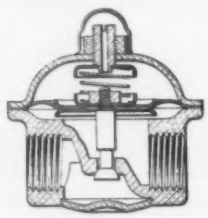
Tagliabue Corporation Opens New York Sales Office

The C. J. Tagliabue Corporation, Newark, New Jersey, has established a sales office at 150 Broadway, New York City 7.

Manufacturer of industrial instruments for indicating, recording and controlling temperature and pressure, the company is a wholly-owned subsidiary of the Weston Electrical Instrument Corporation, Newark, New Jersey.

L. M. Hackenberg, Tagliabue's New York district sales manager, will supervise activities of the new sales office, which serves the greater metropolitan area.

GASCO
Hy-Capacity
APPLIANCE
REGULATORS



These spring-adjusted regulators, designed especially for low input gas appliances assure perfect regulation and safety.

Sturdy all-brass construction in all sizes from ¼ inch pipe size, up. Diaphragm leaks due to shrinkage eliminated.

Dust cap over vent hole prevents stoppage.

Mulcare Engineering Co. Inc.
53 Park Place, New York 7, N. Y.

HERE! FAMOUS Servel

ONLY THE *GAS* REFRIGERATOR STAYS SILENT, LASTS LONGER

Now you can *get* the famous Servel Gas Refrigerator—only refrigerator with no moving parts in its freezing system. A tiny gas flame does the work. So Servel stays silent, lasts longer. New and greater, the Gas Refrigerator brings you wonderful food-keeping conveniences, too. Come choose your model today.

STAYS SILENT...LASTS LONGER
Servel
The GAS Refrigerator

DEALER'S IMPRINT

One of a new series of refrigerator and water heater advertising mats for newspaper use released by Servel, Inc. to all dealers. The new small size ad series, all of which are approved for co-operative advertising credits, are in one and two column sizes. In addition, the series follows the same copy theme used in Servel's national consumer magazine campaign.

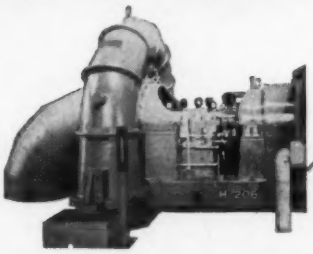
Commercial Kitchens —a New Book

The Industrial and Commercial Gas Section, American Gas Association, New York, announces a new publication, "Commercial Kitchens." It is a comprehensive reference book for all who are interested in commercial cooking equipment.

There are 242 pages of practical information about the commercial kitchen and it is replete with illustrations. It also contains tables and data on capacities of commercial cooking equipment, hot water equipment sizing, ventilation, kitchen layout and space requirements, burner specifications, and other helpful material.

Gas Plants

by people who also build appliances



ROOTS-CONNERSVILLE—CENTRIFUGAL EXHAUSTER

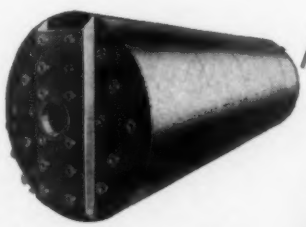
Positive Meters—*Roots-Connersville*
Blowers—*Roots-Connersville*
Purifiers—*Stacey Bros.*
Exhausters—*Roots-Connersville*
Meters—*Roots-Connersville*
Condensers—*Stacey Bros.*
Scrubbers—*Stacey Bros.*
Compressors—*Clark*
Pumps—*Pacific*
Oxygen Plants—*Stacey-Dresser Engineering*
High-Pressure Storage—*Stacey Bros.*
Liquid Propane Gas Plants—*Stacey-Dresser Engineering*

STACEY BROS.—PURIFYING EQUIPMENT

Compressors and blowers and holders and scrubbers are things sold by several makers to put in a plant for manufacturing gas.

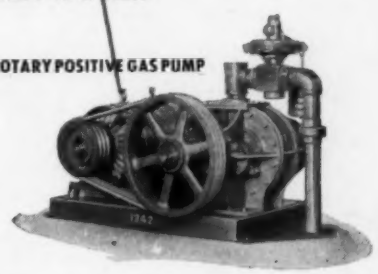
What Dresser Industries offers you is the knowledge of the gas industry from the sale of furnaces right back through the pipe lines, through the compressors and blowers into the realm of research for better ways of making gas.

This means to you that the purchase of equipment from any of the companies grouped under Dresser Industries, Inc., opens to you engineering information of the whole group. Each of the Dresser companies is a specialist in some type of equipment. As a group they can provide a great many alternate types of similarly purposed equipment—reciprocating or centrifugal or rotary positive. So it is not necessary for a Dresser salesman to compromise engineering for the sake of a sale.

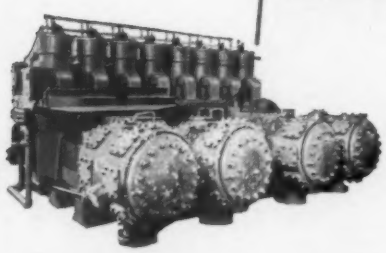


STACEY BROS.—SCRUBBERS

ROOTS-CONNERSVILLE—ROTARY POSITIVE GAS PUMP



CLARK—COMPRESSORS



DRESSER INDUSTRIES, INC.

TERMINAL TOWER • CLEVELAND 13, OHIO

Matched Equipment Matchless Service

BOVAIRD & SEYFANG Mfg. Co.
Bradford, Pa.

BRYANT Heater Company
Cleveland, Ohio; Tyler, Texas

CLARK Bros. Co., Inc.
Olean, New York

DAY & NIGHT Mfg. Co.
Monrovia, Calif.

DRESSER Mfg. Division
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DRESSER Mfg. Company, Limited
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PAYNE Furnace Co.
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ROOTS-CONNERSVILLE Blower Corp.
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SECURITY Engineering Co., Inc.
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STACEY BROS. Gas Construction Company
Cincinnati, Ohio

Stacey-Dresser Engineering Division
Cleveland, Ohio

Ready..

..for your installations in quantity!

Sprague LARGE CAPACITY Meters

Increasing production of Sprague Large Capacity Meters is our answer to your demand for equipment that will accurately measure and carry loads economically today and in the future for home heating and industrial installations.

SPRAGUE METERS

THE SPRAGUE METER COMPANY, BRIDGEPORT 4, CONN.